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BPA

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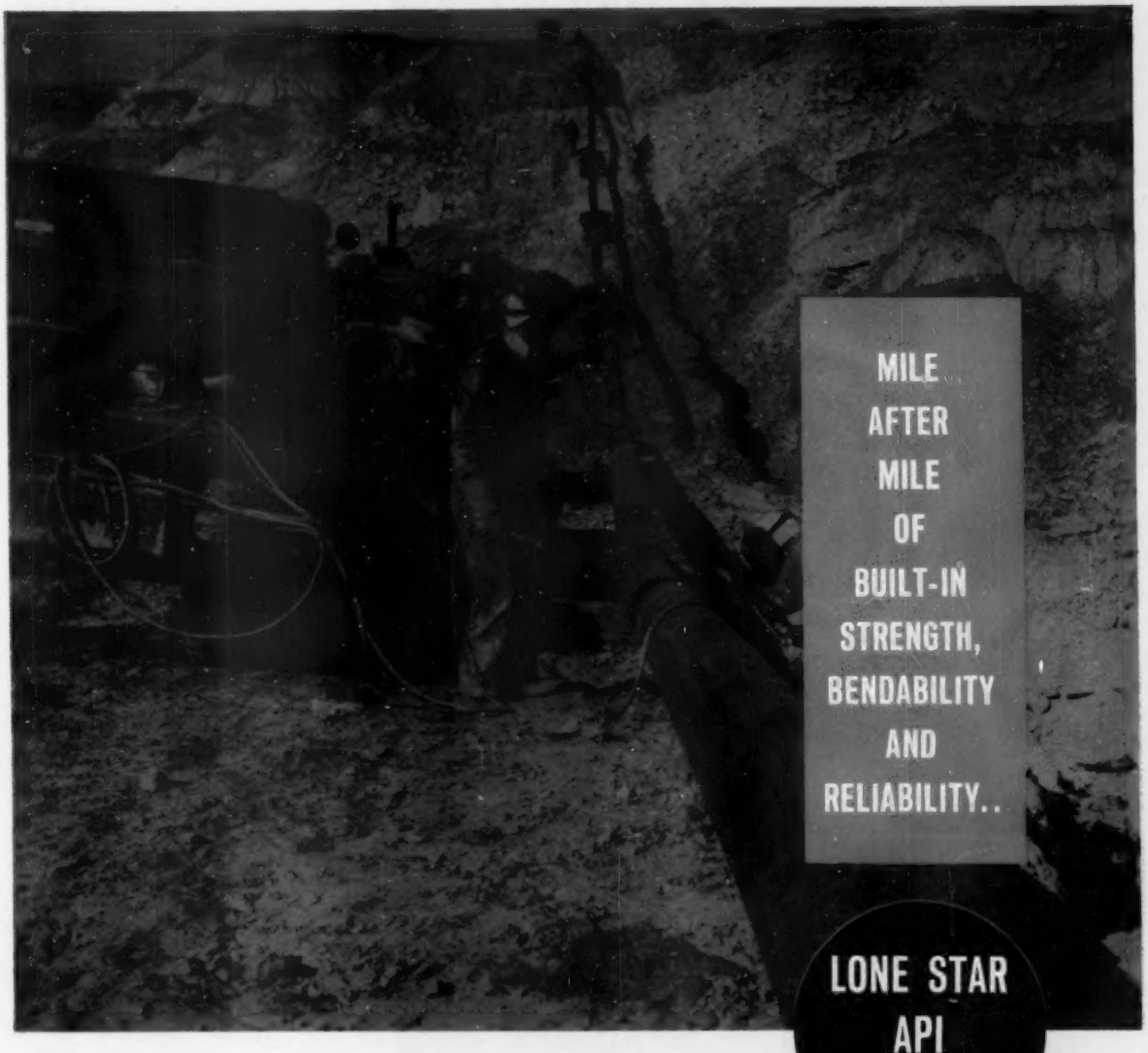

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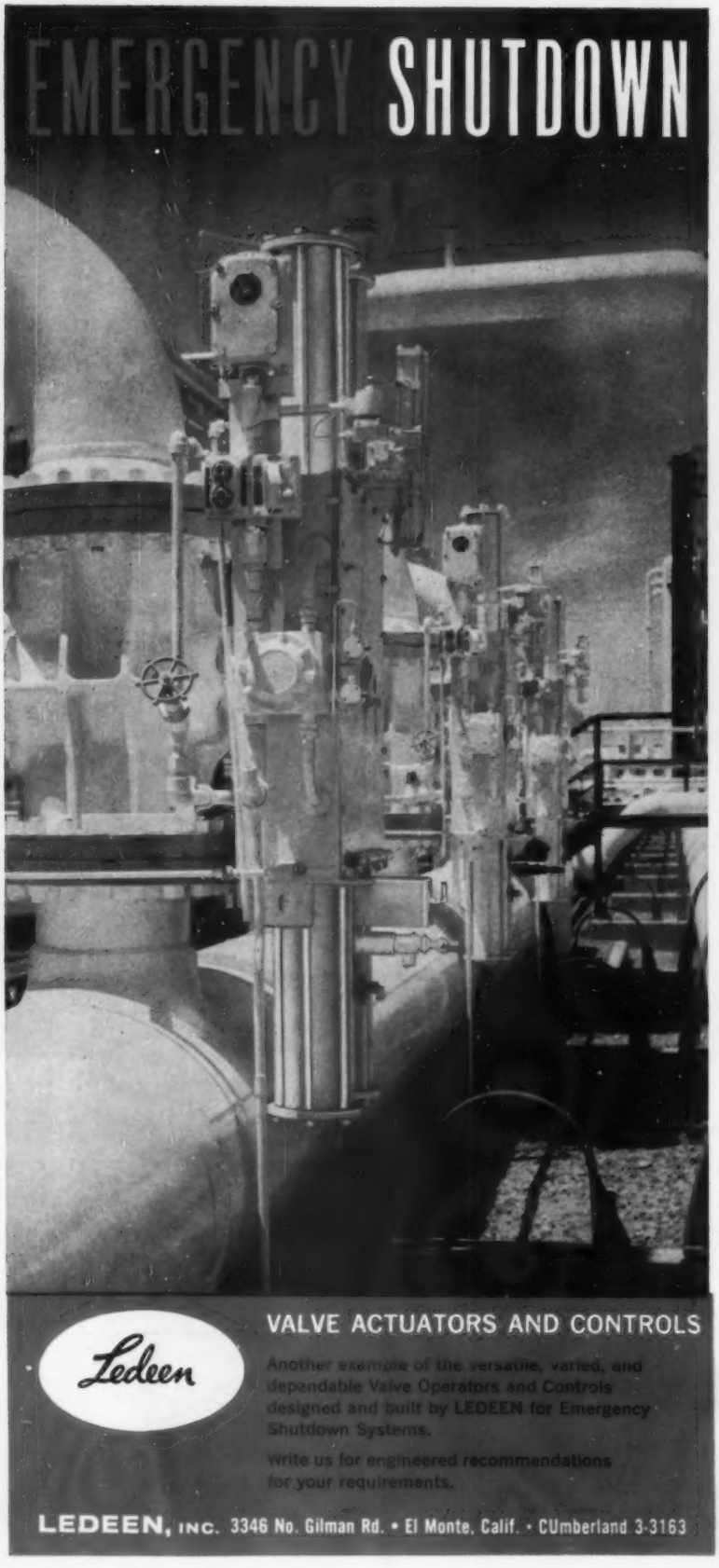
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CALENDAR

April

4-5..Gas Compressor Institute—Liberal, Kan.

4-6..AGA Research & Utilization Conference—Sheraton Cleveland Hotel, Cleveland.

6..Pennsylvania Gas Association Distribution Conference—Tally Ho Inn, Valley Forge, Pa.

6-7..PCGA Distribution Conference—Biltmore Hotel, Los Angeles.

10-13..ASME Oil & Gas Power Division Conference & Exhibit—Jung Hotel, New Orleans

11-13..AGA Sales Conference on Industrial & Commercial Gas—Prince Edward, Windsor, Ont., Canada

13-15..GAMA Annual Meeting—Boca Raton, Fla.

17-18..PCGA Commercial-Industrial Sales Conference—Hollywood Roosevelt Hotel, Hollywood, Calif.

18-20..Southwestern Gas Measurement Short Course—University of Oklahoma, North Campus, Norman, Okla.

24-26..Southern Gas Association Annual Meeting—New Orleans.

27-28..PCGA-PCEA Joint Administrative Service Conference—Villa Hotel, San Mateo, Calif.

May

4-5..PCGA Transmission Conference—Biltmore Hotel, Santa Barbara, Calif.

8-12..AGA Operating Section, Distribution & Production Conference, —Sheraton Hotel, Philadelphia.

15-17..AGA MidWest Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago

25-26..AGA Operating Section, Transmission Conference—Brown Palace and Cosmopolitan Hotel, Denver.

25-26..PCGA Customer Service Conference—Jack Tar Hotel, San Francisco

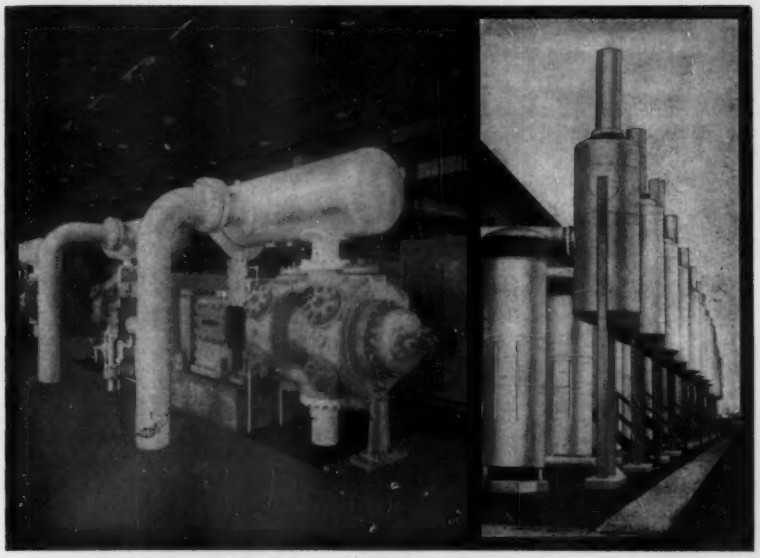
June

6-8..6th Annual Appalachian Underground Corrosion Short Course—West Virginia University, Morgantown, W. Va.

13-14..National Safety Council's Public Utilties Section, Executive Committee—Laurentien Hotel, Montreal, Quebec, Canada.

20-24..Canadian Gas Association Annual Meeting—Banff Springs, Alberta.

26-27..Michigan Gas Association Annual Meeting—Grand Hotel, Mackinac Island, Mich.



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"Whatever man can imagine, man can do . . ."

IN proof of our headline, your editor modestly submits the picture hereabout. Its point is that I always imagined I would get to Hawaii on an occasion other than with sponsorship of the U. S. Army. Hence, the picture, showing this humble person challenging one end or the other of a pickled eel with chopsticks, at a tea house in Honolulu, is compelling evidence in support of our opening quotation.

While in Honolulu—for the Second Biennial Mid-Pacific Gas Merchandising Conference—gasmen were talking about the many futuristic gas-industry programs. Appliance developments will make those we know today archaic in a very few years. Fuel cells and other energy conversion devices are being pushed ahead with large resources of dollars and talent. And, in any gas industry area one looks into, imagination and technology are moving the gas industry still further ahead. Our industry is preparing its "hardware" for the future.

However, is the industry also "researching" men? Specifically, are gas companies "upgrading" their personnel in direct relation with progress of equipment, promotional maturity, and operating technique?

I would point out that progress of any industry in upgrading its products and services is not limited to the inanimate factors involved. To go along and actually pace the marvels it appears we will see in the future, our industry will need highly upgraded men. They'll be needed in management, the technical departments, indeed, throughout gas companies.

One result of improving gas industry products, services, and operations will be mounting personal responsibility. Needed will be management that can make fast, precise decisions. Needed will be operating people who can cope with multiple complex operations at unprecedented speed.

It is my opinion that the second and third rung of gas company supervision seems to need help and encouragement. These are the junior management people today; the top management of tomorrow—providing a son-in-law or two is not moved in on 'em.

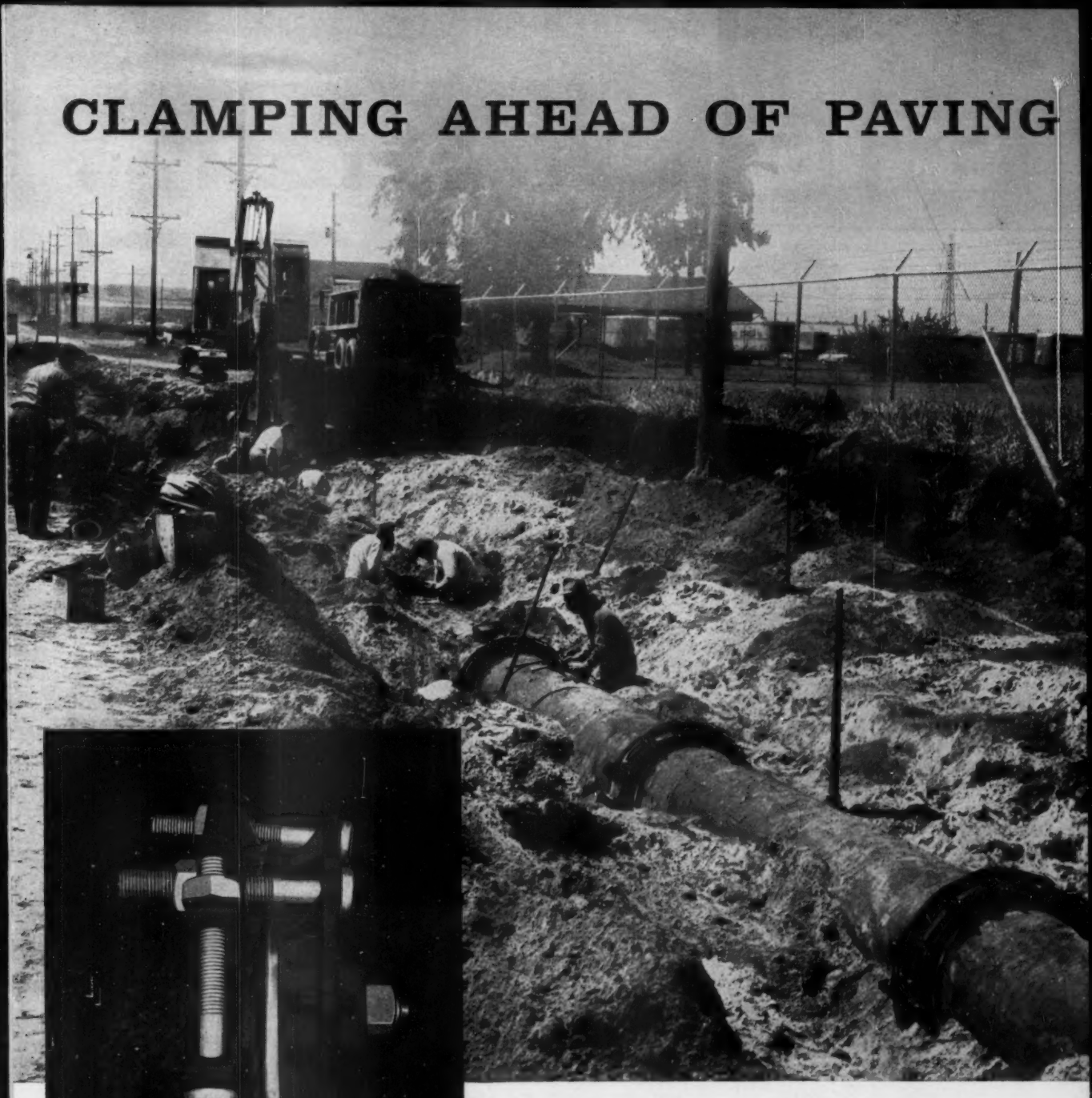
In the gas industry—at least in the groups I have most contact with, public relations and engineering personnel—these people require responsibility. With that, they need the authority to actually make some decisions. Too many of them can't say either "yes" or "no." They can't move, can't operate.

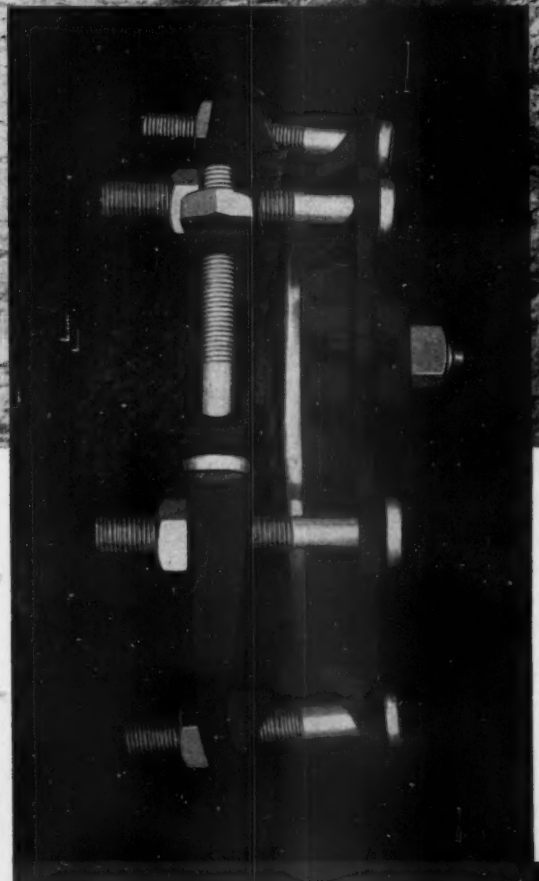
If your junior management isn't encouraged to move on their own without asking 15 people and casting a horoscope or two to see if this week is propitious; if they aren't given a responsible part in the operation of your company; if they aren't encouraged in development of self confidence and handling things themselves—then your company will be in trouble as junior management "upgrades" itself by "on the job training" after reaching more critical positions.

J. Fred Eldan

EDITOR

CLAMPING AHEAD OF PAVING





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GAS HIGHLIGHTS

Area price confab crisp

Some PUC-distributors and gas producers are still an ocean apart on viewpoints. This was made clear at the Midland (Texas) area pricing hearings. FPC's Kuykendall (in an unscheduled appearance) asked that producers stop injecting technicalities ". . . just for the sake of raising them," and said area prices are possibly the *last*, and best hope for fair, workable regulation of gas prices.

Kennedy makes progress

President John F. Kennedy swiftly brought the White House up to modern standards when two big gas ranges were included in a new "family kitchen" he and Mrs. Kennedy are having installed. From GAS: A good move, Jackie and Jack, and happy snacking!

Houston-Coastal to expand in Florida

FPC has authorized Houston Texas Gas & Oil Corp. and Coastal Transmission Corp. to increase capacity of their connected system to Florida by 93 MMcfd to give a max-day delivery of 371 MMcfd.

Electric heat threat

If they don't experience a short circuit somewhere along the line, there will be 18 million homes using electric heating in 1982—says National Coal Policy Conference President Joe Moody. From American Electric Power's Philip Sworn comes a prediction that the 18 million electrically heated homes will be hit in 1978. (Obviously somebody is fidoodling with somebody's figures.) And the Kilowatt Klan is serious—they need electric heat loads to balance out summer peak they experience in more than half the country from air conditioning loads.

Liquemethane plan pushed in New England

AGA is reported to have hopes of installing an experimental concrete-vault type of liquefied natural gas storage project this fall. This method appears to look promising to a group of New England gas utilities who are seriously studying all factors involved in a cooperative methane liquefaction, storage and revaporization project. The New England Gas Pool would take summer off-peak gas; liquefy and store it; then revaporize it for service in the 40 cooperating utilities' service areas during the heating season.

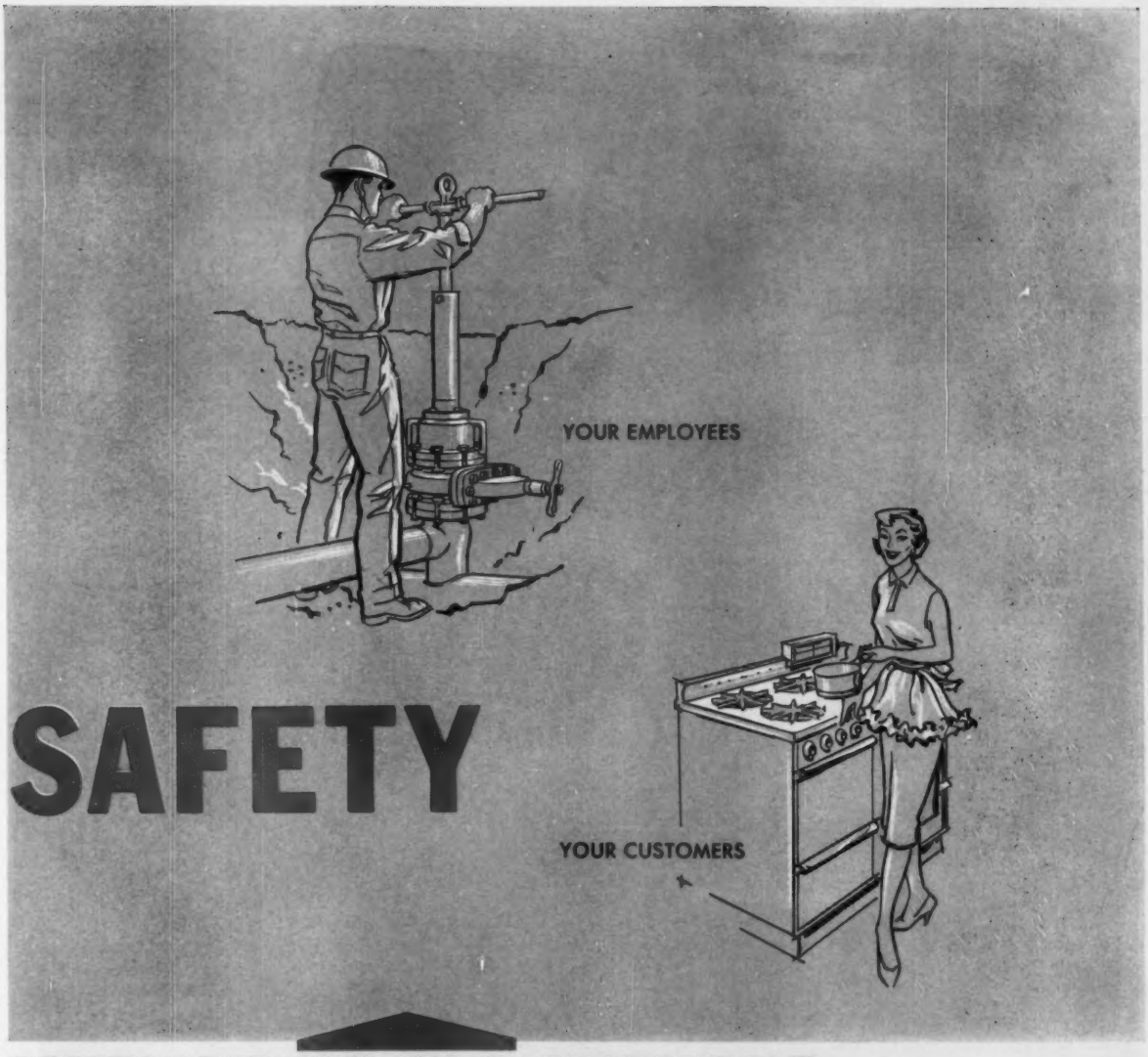
Coal's fuel study hits hitch

The crafty works of the coal industry groups in Washington have been aiming for a 16-man joint congressional committee to make its favorite study—the fuels study, said to be needed in the interests of the fuel-consuming public. But they ran into equally (at least) crafty Speaker of the House, Sam Rayburn. Said Mr. Sam: "Mr. McCormack (Demo majority leader), Mr. Albert (majority whip), and I don't like joint committees," hence, "We got them (House Rules Committee) to pass a resolution setting up a 15-man House of Representatives committee."

Politics block bi-monthly meter reading

East Ohio Gas Co. has dropped its program of electronically estimating gas bills every other month, and is returning to reading meters every month. The program would have saved $375,000 per year in the company's 185-community system.

City of Canton, Ohio, was preparing to take the gas utility to court to make it comply with its franchise in that city which requires monthly meter reading for billing. Then, Cleveland recently passed an ordinance prohibiting collection of extra charges for late payment of estimated bills. So, it was decided to abandon the operation on a system-wide basis as standard procedure is the most economical way of operation. And, it felt it couldn't run its company by deciding operating problems in courts or fighting them out in poltical arenas.



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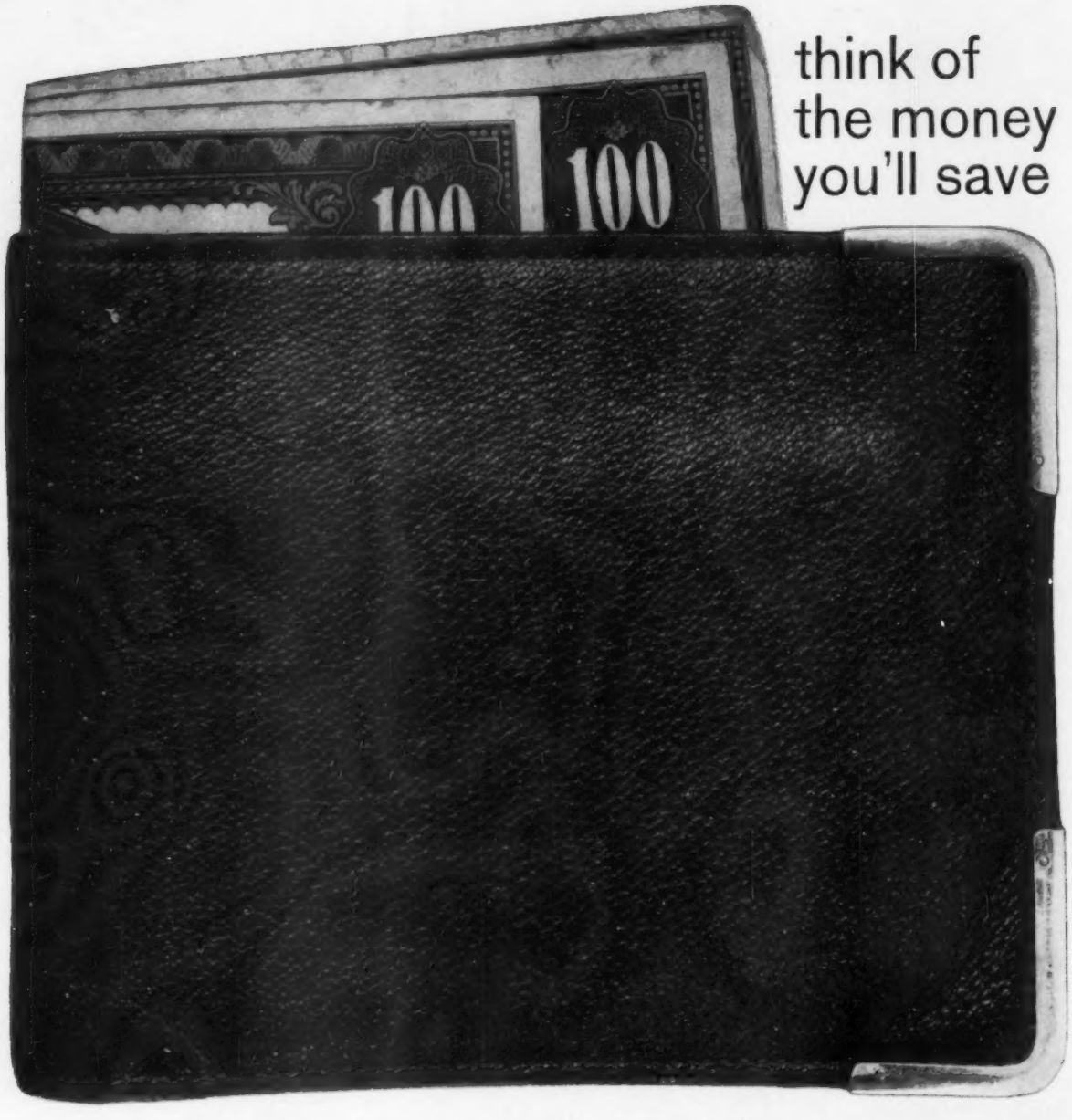

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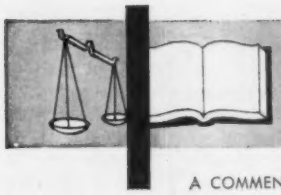

Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

Supreme Court declares broad FPC authority

THE gas industry was split by approval and disapproval of the United States Supreme Court's recent Transco decision affirming FPC's broad discretion in interstate pipeline certificate cases.

The straight gas distribution companies approved the Court's holding that "the commission did not abuse its discretion in considering, among other factors, those of end-use, pre-emption of pipeline facilities and price in deciding that the public convenience and necessity did not require the issuance" of a certificate to Transco to transport natural gas purchased in Texas by Consolidated Edison Co. for use as boiler fuel in New York City. Gas and electric companies like Con Ed are not so vulnerable to loss of load-balancing interruptible large volume gas customers as straight gas companies. Direct sales of industrial gas to large customers by producers or pipeline companies in the service area of a straight gas distributor can be devastating. Local gas distribution systems are sized to accommodate the high winter demands of residential and other firm customers. The interruptible industrial and steam electric generating customers take large volumes of off-peak gas and that provides high utilization of the facilities. The result of that economical operation is the lowest reasonable cost of gas to all classes of customers. When a large interruptible customer is sold gas directly by a producer or pipeline company, the local gas distribution company is deprived of the load-balancing sale and therefore costs to the remaining customers rise.

Disapproval of the Court's majority opinion, written by Chief Justice Warren, came from natural gas producers, who visualized FPC's indirect certificate regulation of the field price of gas, as well as resisting direct sales. The Natural Gas Act exempts direct sales of gas in interstate commerce for consumptive use from FPC rate regulation. However, FPC has used its certificate authority to control direct sales of gas, and in the Transco case it discouraged the bidding-up of field prices. The Supreme Court asserted that "as a matter of common sense, it would seem difficult to deny that the channeling of vast quantities of a wasting resource into unregulated transactions at a high price will result in scarcity to other consumers and a general price increase."

Some segments of the gas industry disapproved the control of ultimate use of natural gas. The coal industry, however, approved the Court's ruling that FPC has sufficient authority over conservation to consider whether the end-use, like gas for boiler fuel in the Transco case, is in the public interest. Coal producers, labor, coal-carrying railroads and related equipment manufacturers contend that coal, not natural gas, should be burned for so-called "inferior" uses like boiler fuel.

Let us examine the significant reasoning of the Supreme Court in the Transco case. The following paraphrase of the majority opinion gives a synopsis of the main issues.

SCOPE OF FPC AUTHORITY

Before the hearing examiner, Transco was opposed by the FPC staff and the coal industry. Transco offered proof that its application met all the conventional tests—adequate gas reserves, pipeline facilities and market for the gas. The FPC's staff argued vigorously that the public interest would suffer were Transco's application granted. The staff said that the gas was to be transported for use under industrial boilers, an "inferior" use from the standpoint of conserving a valuable natural resource; that authorization of this and similar direct sales to major industrial users would result in pre-emption of pipe line capacity and gas reserves to the detriment of residential consumers competing for gas supply; and that the effect of this sale, as well as the resulting increase in direct sales, would effect a general rise in field prices. These contentions were presented as "policy" arguments and no testimony was taken in support. Con Ed contended that certification was in the public interest, principally because a firm supply of natural gas under the Waterside boilers would reduce the air pollution problem. The Waterside station is located near the United Nations and Con Ed introduced expert testimony indicating that the Waterside boilers were major contributors to the air pollution problem in the area. Transco also contended that the factors propounded by the FPC's staff were not open for consideration in a certificate proceeding.

On review of the examiner's decision, the commission held that the broad considerations advanced by its staff were cognizable in a certificate proceeding. The commission agreed that the "idea of ameliorating a smoke condition found unpleasant and annoying . . . is an attractive one" but concluded that "more weighty considerations compel the denial of the grant."

The principal question is whether Congress intended to preclude FPC from denying certification on the basis of the policy considerations advanced by its staff. The "end use" factor reflects the commission's concern that Con Ed's proposed "inferior" use of gas under its boilers would be wasteful of gas committed to the commission's jurisdiction and would pre-empt space in pipelines that might otherwise transport gas

for superior uses. The "price" consideration involves the commission's fear that this sale—which was executed at a price higher than the maximum fixed by the commission in the producing districts involved—would increase the price of natural gas in the field, thus triggering a rise in other gas prices.

In light of what this Court has said on prior occasion concerning the term "public convenience and necessity" in analogous statutes, the ready inference is that the commission has the power to consider the "end use" and "price" factors.

The commission is the guardian of the public interest in determining whether certificates of convenience and necessity shall be granted. For the performance of that function the commission has a wide range of discretionary authority. Its function is not only to appraise the facts and to draw inferences from them but also to bring an expert judgment and to determine from its analysis of the total situation on which side of the controversy the public interest lies.

End use of natural gas

No one disputes that natural gas is a wasting resource and that the necessity for conserving it is paramount. The question in this case is whether the commission, through its certification power, may prevent the waste of gas committed to its jurisdiction. One method of preventing waste of gas is to limit the uses to which it may be put, uses for which another, more abundant fuel may serve equally well. The commission in the past has declared that the use of gas under industrial boilers is an "inferior" use, the assumption being that other fuels, particularly coal, are an adequate substitute where other fuels abound. However, Transco and Con Ed while conceding that gas may be wasted where coal is readily available, argue that Congress has not awarded the commission *any* powers over conservation; rather, this authority has been reserved to the states. This contention is based on the legislative history of the Natural Gas Act.

It is necessary to note the precise limit of the commission's admissions. The commission said that it had not been given "comprehensive" authority to deal with "the end uses for which natural gas is consumed" and that it would not deny certification on that ground alone. The commission did *not* say that it had no authority over the use to which certificated gas might be put nor did it say that end use was a factor beyond its power of notice. In view of contemporaneous statements by the commission which would be inconsistent with the reading Transco and Con Ed press upon us, we think that the 1944 report should be construed as admitting only a lack of comprehensive power to formulate a flat rule against direct sales for use under boilers.

The commission cannot order a natural gas company to sell to users that it favors; it can only veto proposed transportation and it can only do this when a balance of *all* the circumstances weighs against certification. Moreover, the commission has no authority over intrastate sales. Since a large percentage of the gas sold for so-called "inferior" uses is sold within the producing states, this restriction further curtails the commission's power over conservation. In light of this, the commission's position since the 1942 amendment is both consistent and rational. On the one hand, the commission has stated that it does have power to consider end use in a certificate proceeding. On the other hand, the commission has sought, but has not been awarded, comprehensive authority over all aspects of gas conservation.

There is a broader principle here. When Congress enacted the Natural Gas Act, it was motivated by a desire "to protect consumers against exploitation at the hands of natural gas companies." To that end, Congress "meant to enact a comprehensive and effective regulatory scheme." It is true that Congress did not desire comprehensive *federal* regulation; much authority was reserved for the states. But, it is equally clear that Congress did not desire that an important aspect of this field be left unregulated. Therefore, when a dispute arises over whether a given transaction is within the scope of federal or state regulatory authority, we are not inclined to approach the problem negatively. In a borderline case where congressional authority is not explicit we must ask whether state authority can practicably regulate. If we find that it cannot, then we are impelled to decide that federal authority governs.

In this case, the dispute is over the "economic" waste of gas which has been committed to transportation in interstate commerce outside the producing state. FPC has not attempted to exert its influence over such "physically" wasteful practices as improper well spacing and the flaring of gas which result in its loss and are properly of concern to the producing state; nor has the commission attempted to regulate the "economic" aspects of gas used within the producing state.

A producing state might wish to prolong its gas reserves but producing states have no control over the use to which gas is put in another state. Consuming states may control the end use of gas, but the deficiencies of this system are apparent—unless all states cooperate in enforcing a common regulation, the producer may pick a state that will take gas irrespective of the use. Therefore, consistent with the congressional purpose of leaving no "attractive gap" in regulation, we must conclude that the "end-use" factor was properly of concern to FPC.

Bidding-up field prices

The commission's second objection to certification was based on its forecast that this and similar direct sales of gas at unregulated prices higher than those allowed in sales for resale would divert gas to the high-bidding direct purchasers and thus increase field prices both in direct sales and wholesales.

Transco and Con Ed claim that this "policy" consideration masks the commission's true purpose which is to bar direct sales, thus forcing all gas transactions into regulated channels. They argue that such an absolute bar runs contrary to the intent of Congress as expressed in the Natural Gas Act limiting FPC's jurisdiction to sales in interstate commerce for resale.

Were they correct in their interpretation of the commission's action in this case, we would agree that the commission had over-stepped its bounds. Certainly such action would be contrary to our previous statements that the term "public convenience and necessity" connotes a flexible balancing process, in the course of which all the factors are weighed prior to final determination. Indeed such a flat rule would be doubly objectionable because Congress has not given the commission price jurisdiction over direct sales. However, we cannot agree that the commission propounded an absolute rule in this case. Examination of the opinion reveals recurrent reference to the absence of any one controlling factor; as the commission stated, "countervailing factors suffice to *tip the balance* against the grant of authority requested by Transco." If there were any lingering doubt on this point, it is dispelled by the commission's having held many times that transportation of gas sold directly to the consumer *is* in the public interest when the reasons advanced by the applicant have been sufficiently strong.

Continued on page 36

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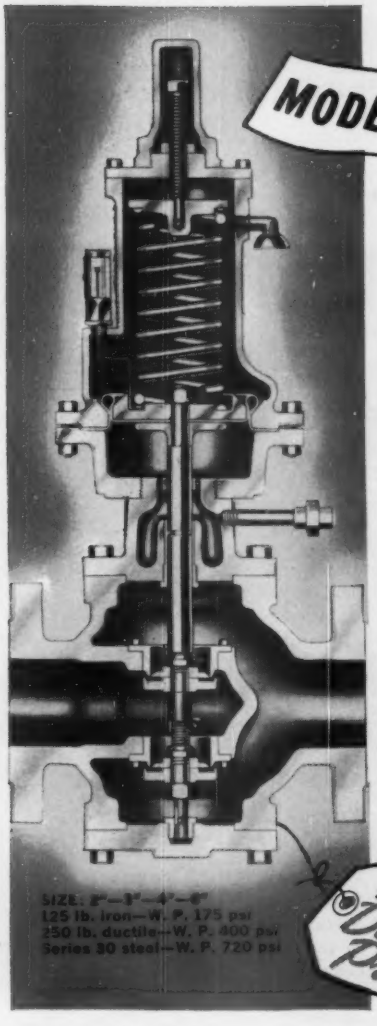

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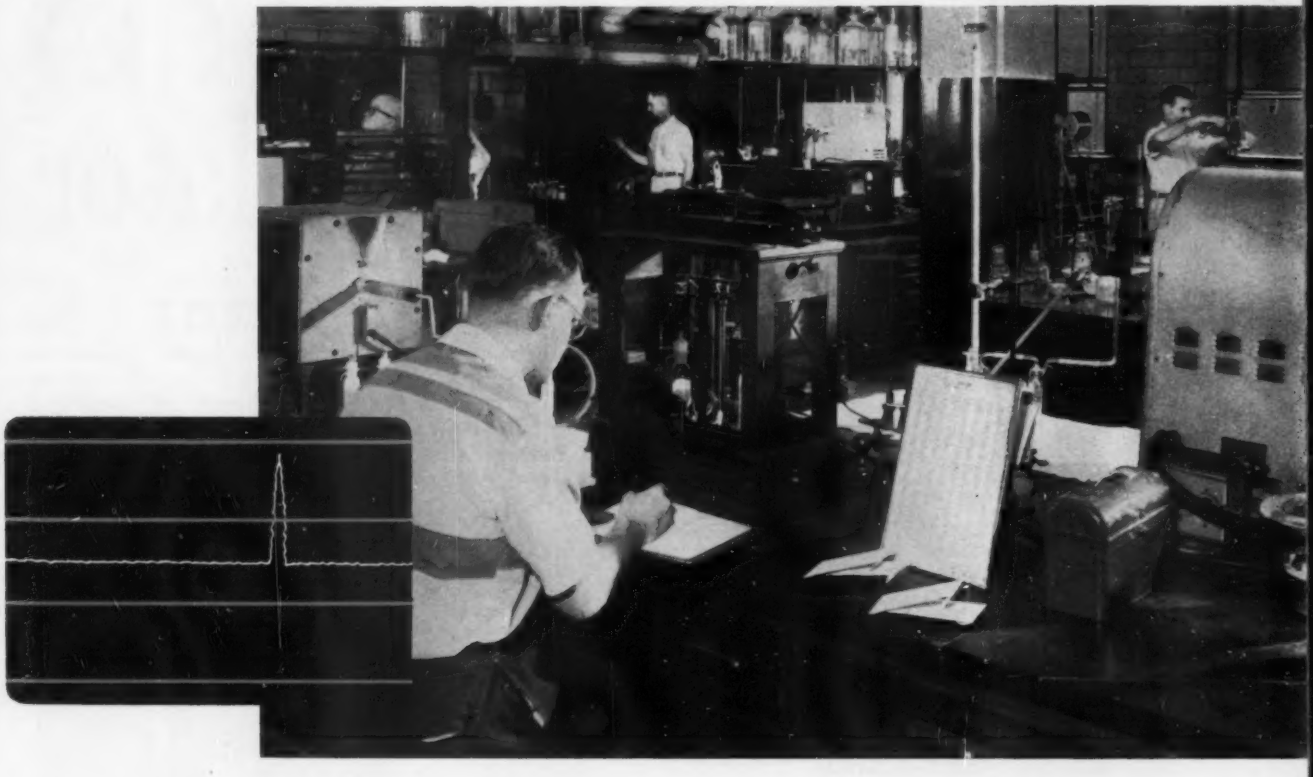

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	.188″	8.64
	.219″	10.00
	.237″	10.79
6⅝	.156″	10.78
	.188″	12.89
	.219″	14.97
	.250″	17.02
	.280″	18.97

TECHNICAL TRENDS

By GUY CORFIELD
Professional Engineer,
Los Angeles

Saline water conversion

Natural fresh water supply, and means of augmenting it by conversion or reclaiming of sea and brackish water, is a problem of universal interest and increasing importance. Of direct concern to the gas industry, many processes will require fuel. In some areas localized supply of fresh water will be more readily obtainable if economic conversion methods can be developed. The Office of Saline Water of the U. S. Department of the Interior is charged with research on the problem and plant-scale testing of methods for its solution.

This office recently stated that we are now using 240 billion gal. per day of fresh water in the U. S. In 20 years, we may have to face a demand that has more than doubled—and obviously the most likely sources are the ocean and brakish inland reservoirs.

The OSW has been authorized to build and operate five different saline water conversion plants. All are still in the planning stage. The first, treating sea water, will use multiple effect evaporation in an assembly of 12 vertical tubes, with special design to prevent build-up of scale and to control corrosion. It will be located on the Texas coast. The second plant, also to convert ocean water, will be built on the Pacific (California) coast. It will be a distillation unit. Original plans called for a nuclear heat source but, as a result of some objections related to safeguards, it now will use a conventional fuel.

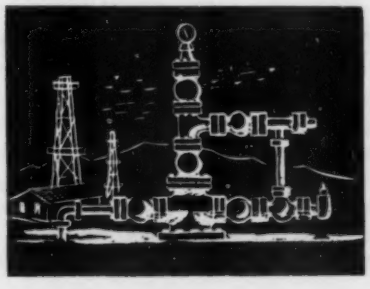
Plant No. 3, in South Dakota, will purify brakish water by use of electrodialysis. A direct-current electrical field is imposed on the water, to make positive salt ions move in one direction and negative ions in the other. Ion-exchange membranes, between electrodes, control movement of the ions and prevent them from reentering purified water. Brakish water will also be treated in the No. 4 plant located in New Mexico. A vapor compression system has been specified, but details have not been released.

A freezing process will be used in the fifth plant, treating ocean water at an Atlantic coast location not yet selected. The principle is that when salt water freezes, salt is rejected and ice crystals are actually "fresh." Success apparently depends on the ability to form relatively large crystals so that precipitated salts can be removed efficiently.

Other methods that OSW is looking at, but which are still in the laboratory stage or of doubtful promise are: "reverse osmosis," whereby salt water and fresh water would be separated by semipermeable membranes including vapor gap, so that fresh water would flow through the membrane assembly from the salt to the fresh side; an electrochemical method wherein salt ions would be adsorbed into porous graphite electrodes in the first cycle, and purified water drained off, electrodes are then reversed in polarity to reject salts into saline water in the second cycle; and direct distillation using solar heat.

Direct conversion of heat to electricity

News items in scientific, technical and popular publications continue to indicate advances in research and development in the direct conversion of heat to electricity. Thermocouples and thermopiles (commonly referred to as thermoelectrics), lead telluride, lead selenide and zinc antimonide are materials most frequently mentioned.



In their earlier, simpler form, using relatively common metals or alloys, thermocouples and thermopiles have been familiar to the gas industry in automatic safety pilot and valve assemblies. Now, with new and more efficient materials providing considerably more electric energy for equivalent heat and temperature difference, the day when gas appliances can generate their own electricity and be completely independent of house current seems to be rapidly approaching.

Fortunately, a thermocouple can operate satisfactorily at the moderate temperatures of gas-air combustion products. Too, high basic efficiency and special burner design are not necessary for successful use in a gas appliance. For instance, where relatively high electric energy is required, as for the blower of a forced warm air furnace, a thermopile assembly can be designed and positioned to take what heat it needs and can utilize from hot combustion products going through a conventional furnace heat exchanger system.

Another "direct conversion" device is the thermionic generator, essentially an assembly of two metal plates. One is heated to "boil off" electrons which are received by the other plate to create a difference of potential between the two (see Technical Trends, February 1959). The thermionic generator operates at a much higher temperature than does the thermocouple. It also develops a considerably higher efficiency.

A combination of the two, with thermocouples receiving "waste heat" from a thermionic generator, seems rather logical. General Electric has recently announced such a development. The two devices are "sandwiched" together and operated at an overall heat-to-electricity efficiency of 16 per cent.

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WASHINGTON

By NEIL REGEIMBAL

GAS Washington Bureau
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FPC's future is anybody's guess

IMMEDIATE future of the Federal Power Commission, as well as the other federal regulatory agencies, is anybody's guess now. There will be changes, but just what they'll be is hidden in the wilderness of the "New Frontier."

The White House in a sharp reversal is now soft-pedaling its much talked of reorganization of the regulatory agencies. From a "we're going to shake them up fast" line, the Administration has shifted to a "we'll work with the agencies to help them improve their operations."

For the next year, this probably means tremendous pressure will be put on members of these agencies quietly by the White House.

One obvious reason for the shift in emphasis is the strong congressional reaction to the White House plans to sweep the agencies under its wing. The agencies are called "independent" because they were created as arms of Congress, not of the executive branch, although the President names the members and the chairmen in most cases.

President Kennedy had a lengthy talk with Rep. Oren Harris (D., Ark.), chairman of the House Commerce Committee — the principal congressional boss of the agencies —just before softening his stand on their reorganization. Obviously, the congressman had a word or two to say on who is going to reorganize these agencies, at least in the public eye.

Compare the following answer by President Kennedy to a news conference question with earlier high-flying promises of drastic action:

"Mr. (James M.) Landis recommended such a White House office (to oversee regulatory agencies) in his study. I have asked Mr. Landis to come to the White House, not to fill such an office, of course, which is not established, but merely to work with the White House and with the interested members of Congress who are concerned about improving our regulatory procedures.

"He is going to stay some months and do that. I conferred yesterday with Congressman Harris, who has a special responsibility as chairman of the House Committee on Interstate and Foreign Commerce, and we are going to continue to work together to try to speed up the procedures of the regulatory agencies and improve their actions.

"Whether we should have such a White House liaison or center is a matter which we are going to consider. The Congress bears special responsibility for these agencies, and, therefore, I think it is probably not likely that major responsibility in this area would be released to the White House, and I am not completely sure it is wise."

There is another reason for the shift in White House attitude, besides some congressional opposition, White House insiders say privately. Mr. Landis, has proven hard for the new Administration to handle. While the Kennedy team agrees with his ideas in general, they don't believe the new "regulatory liaison" director has been as smooth as he should have been in public statements.

It is interesting to note that the post Mr. Landis is now filling was termed "regulatory czar" in his initial study, and later softened to "overseer" by the White House when he was appointed. This is now reduced to "liaison" man, and the post is only temporary, it is indicated.

President Kennedy knew when he determined to set out to "capture" control of the regulatory agencies that it would be a ticklish task, and one which would take extreme political skill. Turning campaign and post-election charges into presumably corrective action, and at the same time getting firm control of the agencies, was certain to be a difficult job.

Generally, men who accept posts within the White House, as Mr. Landis did, work behind the scenes, quietly, staying out of the limelight entirely. Mr. Landis has not followed this course.

In his first weeks in office, he made frequent public speeches and statements, apparently enjoying the fame that goes with his job. But these statements often didn't gibe with the public statements from the White House, and several times amounted to waving a red flag before the congressional bull.

On Jan. 27, for instance, he proposed at a New York State Bar Association meeting that an "administrative conference" be set up with a permanent secretariat to coordinate the work of these agencies. Purpose was to develop a unified regulatory system out of the present isolated units. The Kennedy Administration would have over-all leadership in reforming the agencies, he added, because Congress cannot take the lead.

Thus, major revision in the legal structure of these agencies will be delayed for some time while the

Continued on page 131

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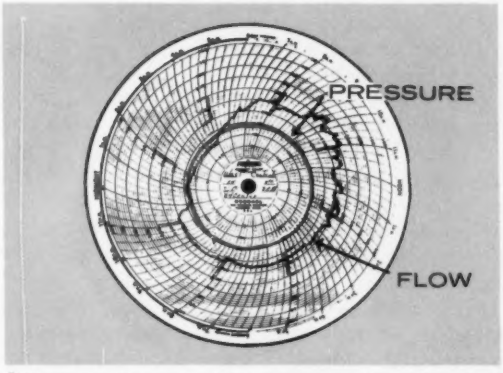

*These are the words of the measurement superintendent of a southern transmission company after seeing the charts of a 4″ Fisher Type 403 operating on a widely fluctuating gas load, with flow rates varying as much as 1,500,000 SCFH. Inlet pressure ranges from 350 to 750 psi—outlet pressure 140 psi. Note that the chart, reproduced above, shows a perfect circle with complete absence of cycling. (Actually, on some jobs, the load goes from pilot lights to full load and back again, and the 403 still maintains a perfect circle.)

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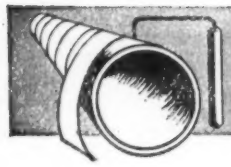

Speak the language

By MARSHALL E. PARKER
Consulting Engineer, Houston

THE basic aim of a corrosion control program can only be stated in economic terms—to make the total cost of corrosion, for a given set of facilities, a minimum. The total cost of corrosion must include the losses, direct and indirect, due to corrosion, and also all of the costs of combating corrosion.

Management's basic aim is similar, but more inclusive—to maximize the company's earnings. Minimizing costs is one method of approaching this aim, of course, but it is *total* costs in which management must be interested. To evaluate the total costs of a suggested project, or its total savings, or, more accurately, its total economic effect on the company's position, requires a detailed knowledge of a great many factors which lie outside any specific department. The cost of money, for example, varies widely with time in the operations of any company; the tax position, the relationship of earnings to the permissible rate of earnings, possible mergers or other company moves—all these affect the economic calculations involved in decisions on projected operations.

Since these decisions must be made with all these factors in mind, who should make them? It is easy for the corrosion engineer to say that his function should be to supply management with all of the engineering cost data, and leave up to management the responsibility of supplying the knowledge of the other factors and the making of the final decision. A second alternative is for the engineer to inform himself on the various factors involved, make what he considers the best choice, and submit it to management for approval. Of these two alternatives, the second is much to be preferred, for many reasons.

In the first place, the first alternative cannot really be executed. Without knowledge of all of the pertinent factors, the engineer cannot prepare estimates on the correct set of possible plans. Even with the necessary guidance from management which will avoid this pitfall, he will still find great difficulty in getting any attention, so long as he presents his recommendations in strictly technical terms. Although he may feel that it is management's responsibility to learn to speak the engineer's language, the fact remains that if management fails or refuses to do so, the engineer has no recourse other than to speak management's language—and this is the language of economics. Even if management is going to make the decision, it is still necessary for the engineer to master all of the economic aspects of the business in order to be heard effectively.

Secondly, for the engineer to limit his activities to the preparation and presentation of alternate methods, without recommendations, is for him to doom himself forever to sit in the anteroom, hat in hand, while management speaks with those who concern themselves with the whole picture—or with what management thinks is the whole picture. No engineer needs to be told that those who are inside are accountants — for they have specialized in talking management's language for years.

An engineer who follows the second and more arduous path—who studies economics and his own company, so that he can evaluate programs and possibilities in a realistic framework, can really function as an engineer should. He can do his whole job, instead of just a part of it. He can present to management a complete program, with adequate and accurate reasoning backing up the decisions which go to make it up. As time passes, and he establishes himself as competent and able, more and more his recommendations will come to be accepted as submitted. When this condition comes about, he will for all purposes be functioning as a part of management.

Let the engineer, then, pursue this course. Let him become familiar, not only with the principles of economics, but with the particular set of economic methods and policies to which his own company is committed. Further, let him seek from management the necessary information as to company position, company ambitions, company policies, so that he may make complete decisions. True, he must then "sell" these decisions to management; but this is a more fruitful and rewarding pursuit than merely submitting a series of proposals, among which management chooses by criteria unknown to the author. Let the engineer pursue this course faithfully, and the near-monopoly on management positions held by former accountants may be broken!

I have just heard a newscast, on a national network, on which it was said that "two men were killed, and a number injured, by *the* explosion *of* a huge Petrochemical plant at—" To anyone who has seen a huge Petrochemical plant, this summons up the image of a truly stupendous explosion. Since most people have not seen such a plant, it probably gives the picture of the total destruction, in one blast, of a fairly small establishment. What was really meant, of course, is that the deaths and injuries were "by *an* explosion *at* a huge Petrochemical plant, etc."—*Marshall E. Parker*

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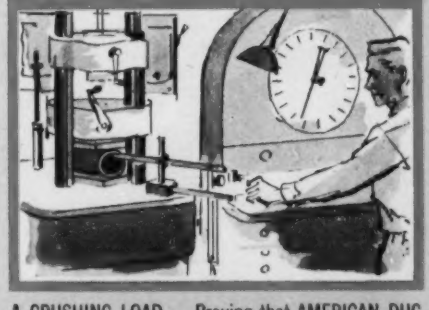

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THE GASSING GAME

By JIM CLARK • Gas & Oil Consultant, Houston

LATE last month in St. Louis, the government's import control administrator, Lawrence J. O'Connor, Jr., said the time might be near when the producing states will need a prorationing program for natural gas liquids.

What this means, of course, is some kind of natural gas prorationing, since the liquids are produced with the gas except in those cases where it is recycled.

What O'Connor brings up is a growing and serious problem which started before World War II when gas was a drug on the market, particularly in Texas. In those days when an oil operator found a gas sand his most likely course was to plug it up. If the well would also produce oil, he was permitted to flare most of the gas into the atmosphere.

Finally, the Texas Railroad Commission (to be followed by other regulatory bodies) decided that if a market could be found for gas, or if it were put to any good use (even if given away), the operator could produce unprorated all of the liquids that came up with gas.

This was a tremendous attraction since, by that time, oil wells were being prorated drastically. There were many cases where large fuel-consuming industries made deals with oil producers with shut-in gas to take the gas off their hands for a penny or two a thousand, with the proviso, of course, that the operator would be able to keep the liquids he separated from the gas. It was also usually provided that the purchaser of the gas would lay a pipeline to the field as well as a gathering system within the field to each individual well.

In those days, this country was a net exporter of oil. Overall demand was no problem after the flush production of the Oklahoma City and East Texas fields had been properly adjusted to market demand under state law. Therefore, the unprorated gas liquids presented little problem. The operator who happened to come across a gas reserve that was sufficiently important to attract a good market was simply considered lucky. These men, in many cases, were able to outstrip their fellow operators. They became wealthy while the average oil operator had to continue the struggle.

With the coming of the long lines, the opportunities increased. Of course, to take advantage of the situation required investment in absorption plants and other types of operations to remove the liquids from the gas. The day when it could be done by a simple field separator was over.

Since imports have created such enormous problems, gas liquid production has assumed serious proportions.

For the past three or four years, Gen. Ernest O. Thompson, the veteran member of the Texas Railroad Commission, has missed no chance to impress audiences, reporters, and his oil friends with the fact of excessive gas liquids and inability of the commission to retard the flow. This condition has been largely responsible for 8-, 9-, and 10-day oil production orders in Texas. So far, Thompson has not suggested that gas should be prorated, but he has left some fairly broad hints. On the other hand, independent oil and gas associations have suggested that gas should be prorated.

In his talk, O'Connor pointed out that since 1954 the production of gas liquids has increased 62 per cent and that in 1960 the daily production of these liquids averaged 630,000 bbl. O'Connor then made a direct suggestion that the states do something about this problem. And, he left the impression that if they failed to do so, the federal government probably would.

He said: "Essentially the control of such (gas) liquids lies with the states themselves, and at this juncture, we can only urge that vigorous and forthright action be taken to relate these liquids to over-all market demand of unrefined petroleum."

This, it seems, is throwing the ball right into the hands of the state regulatory bodies. There is little doubt, in my opinion, that the Texas Railroad Commission will follow the suggestion as soon as practicable. In fact, there might be some truth to the word that Gen. Thompson himself planted the seed that grew into Administrator O'Connor's talk.

If this proration of gas liquids comes about, it is going to bring a few other problems. Naturally, it will be necessary to either store excess liquids or to reduce gas production. If the latter happens, the smaller reservoirs of gas, which have not heretofore been attractive to transmission companies, may become so as gas demand grows and individual well production is reduced to hold gas liquid production to market demand on a ratable take basis.

The impact of natural gas liquids proration (which would also amount to gas proration) on the entire natural gas industry and all of its segments would be considerable.

But such proration is almost certain to come about as soon as state legislators get around to it and that may not be too far away. ■

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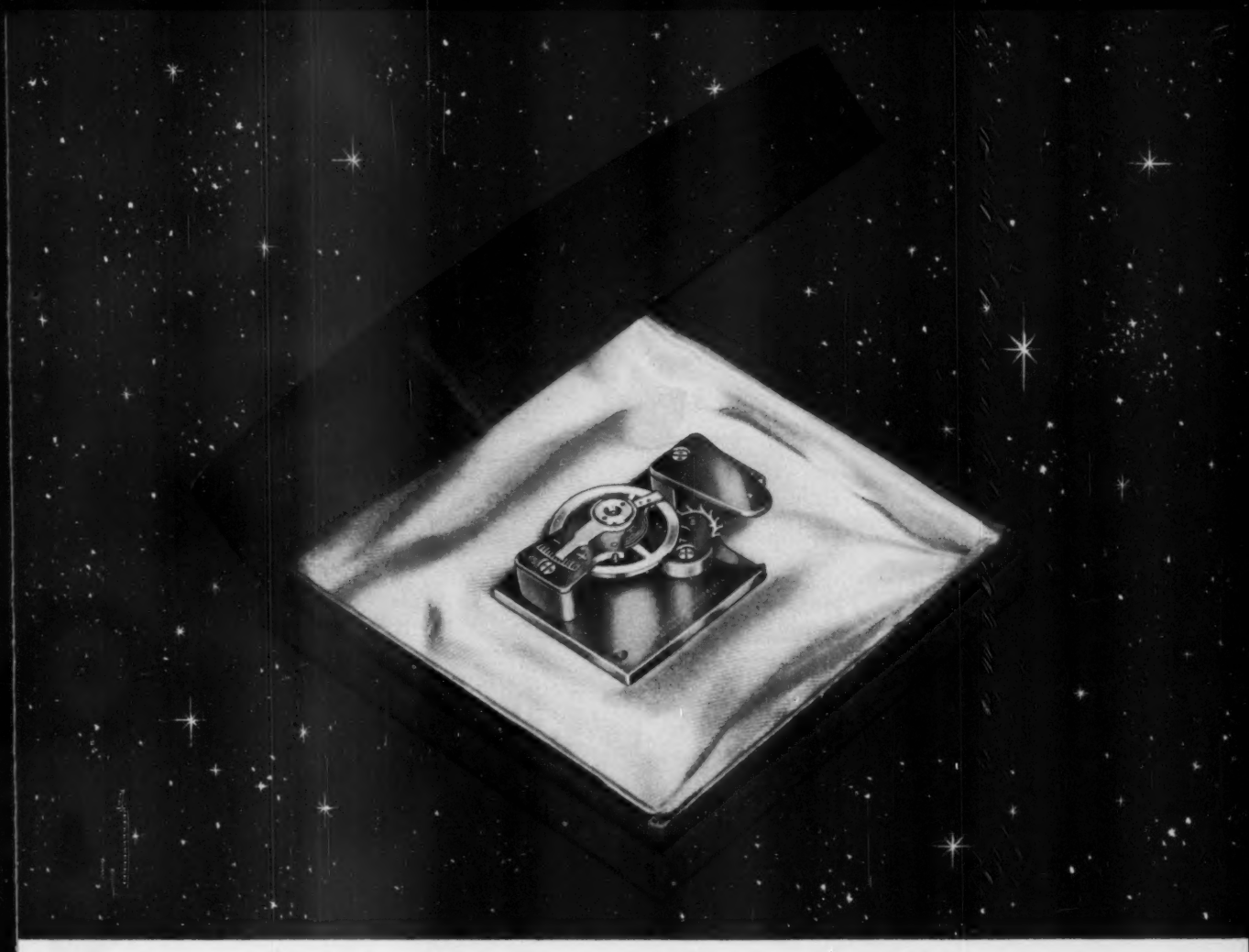

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See how easy it is to convert to seven different rotation rates

The main arbor on the basic chart drive has a rotation rate of seven days. Economical snap on turrets convert this rate to 8 day, 15 day, 16 day, 24 day, 30 day, 31 day and 24 hour rotation. No tools are required and you can even change chart rotation without removing the drive from the instrument.

Now, for the first time you get the extra value of a jeweled movement. This superior construction makes Rockwell chart drives more accurate and sensitive than ordinary chart drives. It requires less power to drive and is extremely durable since there are seven hard jeweled surfaces to overcome friction and wear.

You can use these jeweled movement chart drives *with profit* to power all your recording instruments. They will adapt into practically any instrument case. Speed changing turrets (see left) permit varying rotation rates at will. Write for bulletin. Rockwell Manufacturing Company, Dept. 60F, Pittsburgh 8, Pa. In Canada, Rockwell Manufacturing Company of Canada, Ltd., P.O. Box 420, Guelph, Ontario.

JEWELED CHART DRIVES

another fine product by

ROCKWELL

BROADER WARRANTY . . . . . GREATER ECONOMY AND DURABILITY '61 FORD TRUCKS

The new extended warranty for all 1961 Ford Trucks is just one example of the many ways Ford gives you maximum protection for your truck investment. Each part, except tires and tubes, is now warranted by your dealer against defects in material or workmanship for 12 months or 12,000 miles, whichever comes first. Warranty does not apply, of course, to normal maintenance service or to the replacement as normal maintenance of such items as filters, spark plugs and ignition points.

The excellent fuel economy of Ford's modern 223-cu. in. Six has been proved in certified tests by independent experts over a 3-year span. Front tires on Ford conventional ½-tonners also lasted up to twice as long as those on other makes with independent suspension.

In addition to price, fuel and tire savings, 1961 Ford Trucks provide greater freedom from nuisance problems that crop up with other trucks. Ford's rigid quality controls give you the strongest safeguard of truck reliability ever. Fords stay on the job . . . out of the shop!

F-100 Chassis-Cab models have new stronger frame for greater durability and longer wheelbase for smoother ride. 28% more glass area in cab gives you new wide-angle view to front, sides and rear.

New Econoline Van . . . modern cab-forward design gives as much as 57 more cubic feet of cargo space in nearly three feet less length than conventional half-ton panels. It's America's lowest-priced* van and can cut yearly operating costs by $100 or more.

New 4-wheel drive pickups . . . priced to save you plenty, Ford's 4 x 4's come in ½- and ¾-ton capacities. They're tougher than ever with stronger frame, improved suspension and new optional heavy-duty front axle on ¾-tonners.

*Based on a comparison of latest available manufacturers' suggested retail prices

ALL-NEW
FORD "BIG SIX"
262-cu. in. engine

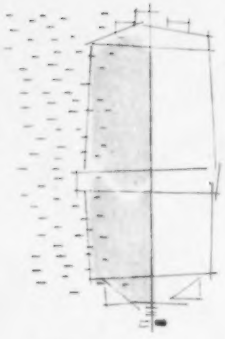
Now, the rugged simplicity of a big 262-cubic-inch Six combined with the dependability of heavy-duty, exclusive-truck engine design. It's yours in America's toughest two-tonners from Ford!

In a grueling 40,000-mile test of reliability, Ford's new Big Six was pitted against its principal competitor in the 2-ton field. Result: Ford's new engine required far fewer service adjustments. This means you can expect less time in the shop . . . more time on the job.

FORD TRUCKS COST LESS

SEE YOUR FORD DEALER'S "CERTIFIED ECONOMY BOOK" FOR PROOF!

FORD DIVISION, Ford Motor Company



DOLLINGER
DRY FILTER
SPECIALISTS
FOR
40 YEARS

STOP

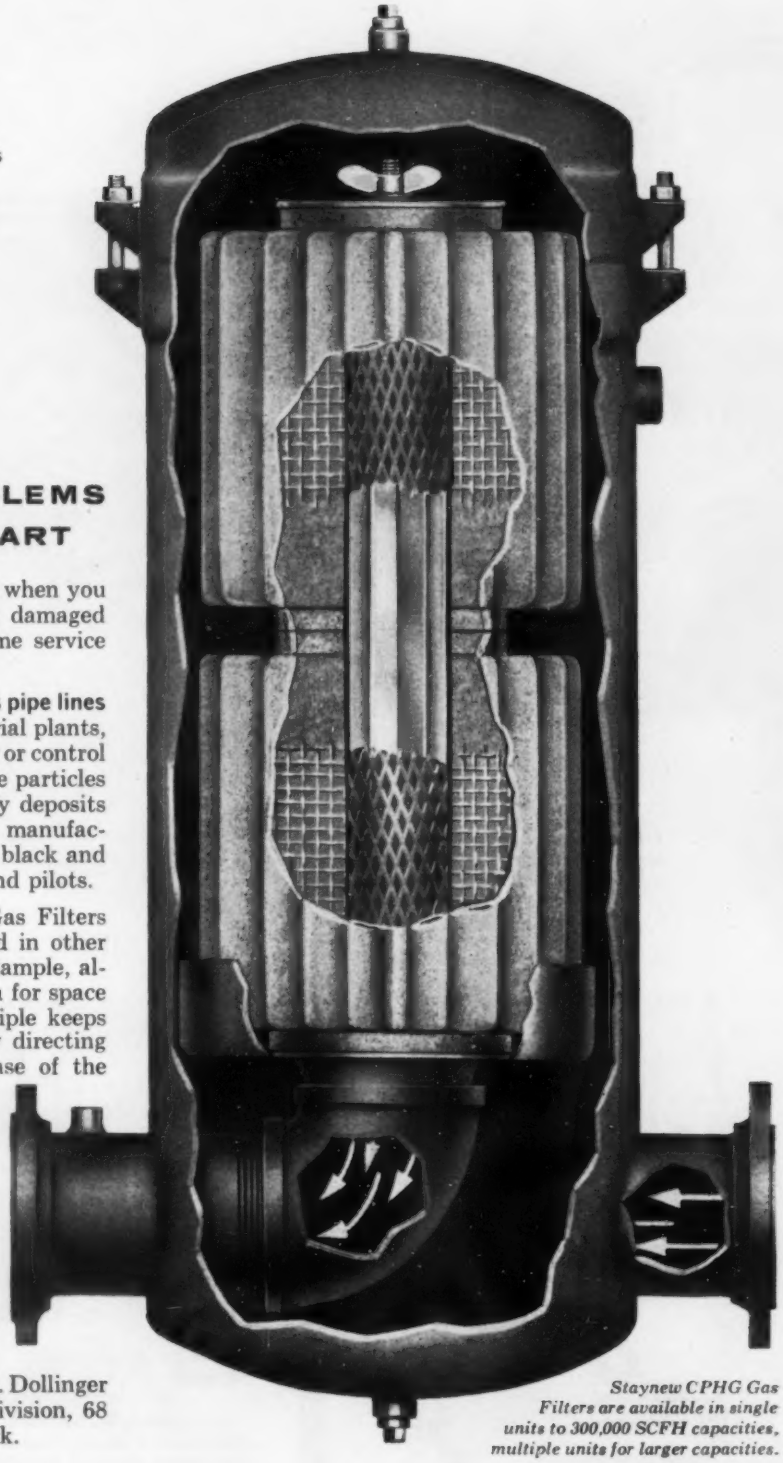
CONVERSION PROBLEMS BEFORE THEY START

Specify Dollinger Staynew Gas Filters when you install natural gas. They eliminate damaged regulator valves and stop bothersome service calls resulting from clogged pilots.

Model CPHG is installed in natural gas pipe lines at district regulator stations, industrial plants, power plants and in other large meter or control stations. Staynew Gas Filters remove particles ranging from dry oxide to sticky oily deposits left from oil fogging operations. In manufactured gas lines, the filters stop lamp black and moisture from entering regulators and pilots.

Many exclusive features. Staynew Gas Filters offer a variety of benefits not found in other filters. The Radial Fin Insert, for example, allows the greatest active filtering area for space occupied. The Double Action Principle keeps resistance to flow at a minimum by directing heavier-than-air particles to the base of the filter and away from the filter element. Dollinger Staynew Filters are accessible for cleaning and inspection without breaking pipe connections. Finally, the outlet and inlet connections of the filters can be varied to suit individual requirements.

Find out how you can benefit from Staynew Gas Filters. Call the experienced Dollinger representative near you. Or, write for Bulletin 290-R. Dollinger Corporation, Industrial Products Division, 68 Centre Park, Rochester 3, New York.



Staynew CPHG Gas Filters are available in single units to 300,000 SCFH capacities, multiple units for larger capacities.

PROTECTOMOTOR

STAYNEW FILTERS

DOLLINGER

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

now try this one for SIZE!

A 7000 cfh* line-mounted Rootsmeter less than 18" long

Now you can have the advantages of both rotary-positive-displacement metering and line-mounting in a 7000 cfh Rootsmeter, Model 7M125, as well as in the already widely accepted 3000 cfh model.

Rootsmeters are accurate through wide ranges of pressure and flow—unaffected by fluctuations. And because of Roots proved operating principle, you can be sure the accuracy is permanent.

The new meters are designed for easy line-mounting. The 7000 cfh model is less than 18" long, and the 3000 cfh model is only 14" long. Connections are flanged to ASA C.I. standards, and line-mounting Rootsmeters require no special supports for simple horizontal or vertical installation.

There are a lot of other advantages in these Line-Mounted Gas Meters, too. You can easily read total flow through the convenient protective lens of the direct-reading volume register, yet the register itself is enclosed entirely within the meter case, eliminating problems incurred with external counters. And if you wish, the meter can be easily instrumented. Maintenance is simple: just replenish the oil occasionally; convenient bulls-eye oil-level gauges make checking easy. There are no internal valves, orifices, or diaphragms to wear or be damaged, and no stuffing boxes to maintain. Testing is easy too, with simple connections provided for standard proving procedures.

Whether your problems are in gas production, transmission, or distribution, or if you meter industrial or institutional gas, you'll find Line-Mounted Rootsmeters the most accurate and dependable, easiest to install, and most convenient gas meters you've ever used. Call your Roots-Connersville engineer or write for details of all the advantages of new Line-Mounted Rootsmeters.

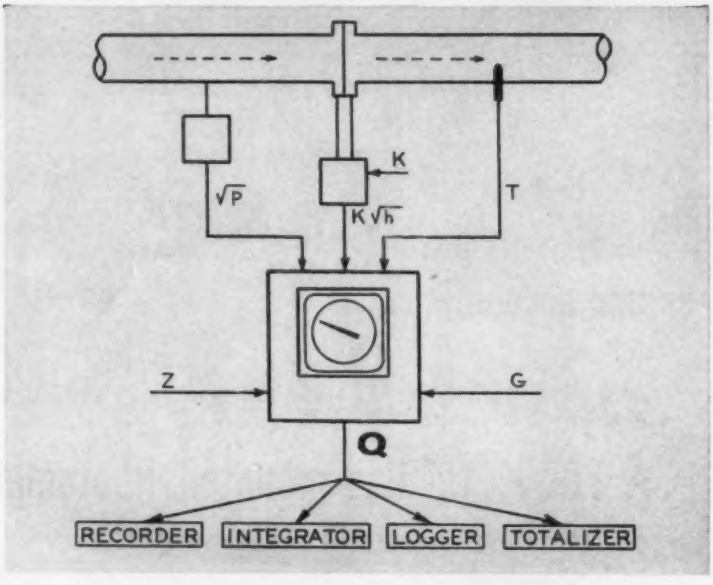
*Dial Rate

ROOTS DRESSER INDUSTRIES INC.
OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

ROOTS-CONNERSVILLE BLOWER DIVISION
900 W. MOUNT STREET, CONNERSVILLE, INDIANA
In Canada—Roots-Connersville Blower (Canada) Ltd., 629 Adelaide Street, West, Toronto

How Bristol Gas Flow Computers automatically compute and integrate corrected flow,

$$Q = K\sqrt{\frac{hP}{TGZ}}$$



Dyna-Servo transducers measure absolute static pressure (P) and differential pressure (h), then translate these values into electrical signals proportional to $\sqrt{P}$ and $K\sqrt{h}$ (where K is the orifice flow constant). Absolute flowing temperature (T) is measured by a resistance bulb.

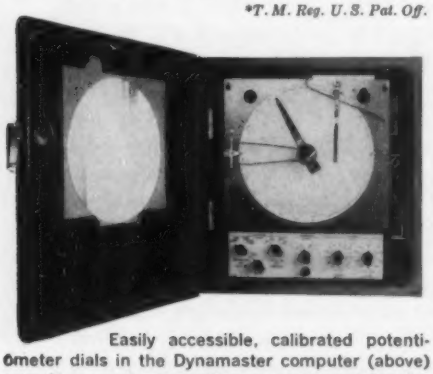
Dynamaster* computer receives these electric analog signals and applies corrections for specific gravity (G) and supercompressibility (Z) to solve the mass flow equation

$$Q = K\sqrt{\frac{hP}{TGZ}}$$

Flow rate (Q) is recorded on round or strip chart.

Flow rate may be integrated and digitally printed at the gate station and—via Bristol Metameter* telemetering—may be transmitted any distance for recording, integrating, totalizing and automatic logging at the dispatching center.

**T. M. Reg. U. S. Pat. Off.*



Easily accessible, calibrated potentiometer dials in the Dynamaster computer (above) permit accurate control-room compensation for changes in gas composition. Multi-position switches in the Dyna-Servo differential pressure transducer permit instant matching of flow constant and selected orifice plate.

The new Dyna-Servo-Dynamaster computer system combines increased accuracy and reduced instrument costs. In eliminating the need for separate receiving instruments for each flow variable and in performing all computing and compensating electrically, the new Bristol system reduces sources of both error and cost.

Continuous integration enables dispatcher to operate closer to contract limit. Accurate, continuous totalizing allows dispatcher to wait until the last possible moment before discontinuing service to interruptible customers—and insures against costly over-runs.

Gate station computing reduces transmission costs. Since only a single variable—corrected flow—need be telemetered to the central dispatching office, only one telemeter channel is required.

Advanced Bristol instrumentation for gas metering includes a wide range of sensing elements and transducers, gate-station and remote computers, improved telemetering systems, and automatic loggers.

For information and assistance in improving reliability and reducing operating costs in your system, write to The Bristol Company, 119 Bristol Road, Waterbury 20, Conn., a Subsidiary of American Chain & Cable Company, Inc. 0.39

ACCO

BRISTOL ...leader in instrumentation for the gas industry

AUTOMATIC CONTROLLING, RECORDING, LOGGING AND TELEMETERING INSTRUMENTS

DIG TRENCH AND BELLHOLES IN SINGLE PASS

The Cleveland JS-30 Trencher digs bellholes at pipe joints, digs flush to obstructions, slopes as it digs.

Note the ample-width bellhole in the foreground above. The JS-30's exclusive power-shifted digging wheel shifts 2½ feet to each side of center to dig bellholes like this and to keep trench in line even when crawlers are being steered around side obstructions.

The JS-30's wheel power-*tilts*, too—saves blocking and cribbing when either crawler track is higher than the other on curbs, side slopes, etc.

Note, too, how the JS-30's power-shifted V conveyor with operator-controlled speeds up to 1,000′ per minute—another Cleveland exclusive—easily handled the big spoil volume from the wide-sloped trench. The JS-30 sloped the trench to 6′ top width as it dug.

The JS-30 is a trencher of amazing utility. Write today for all the facts.

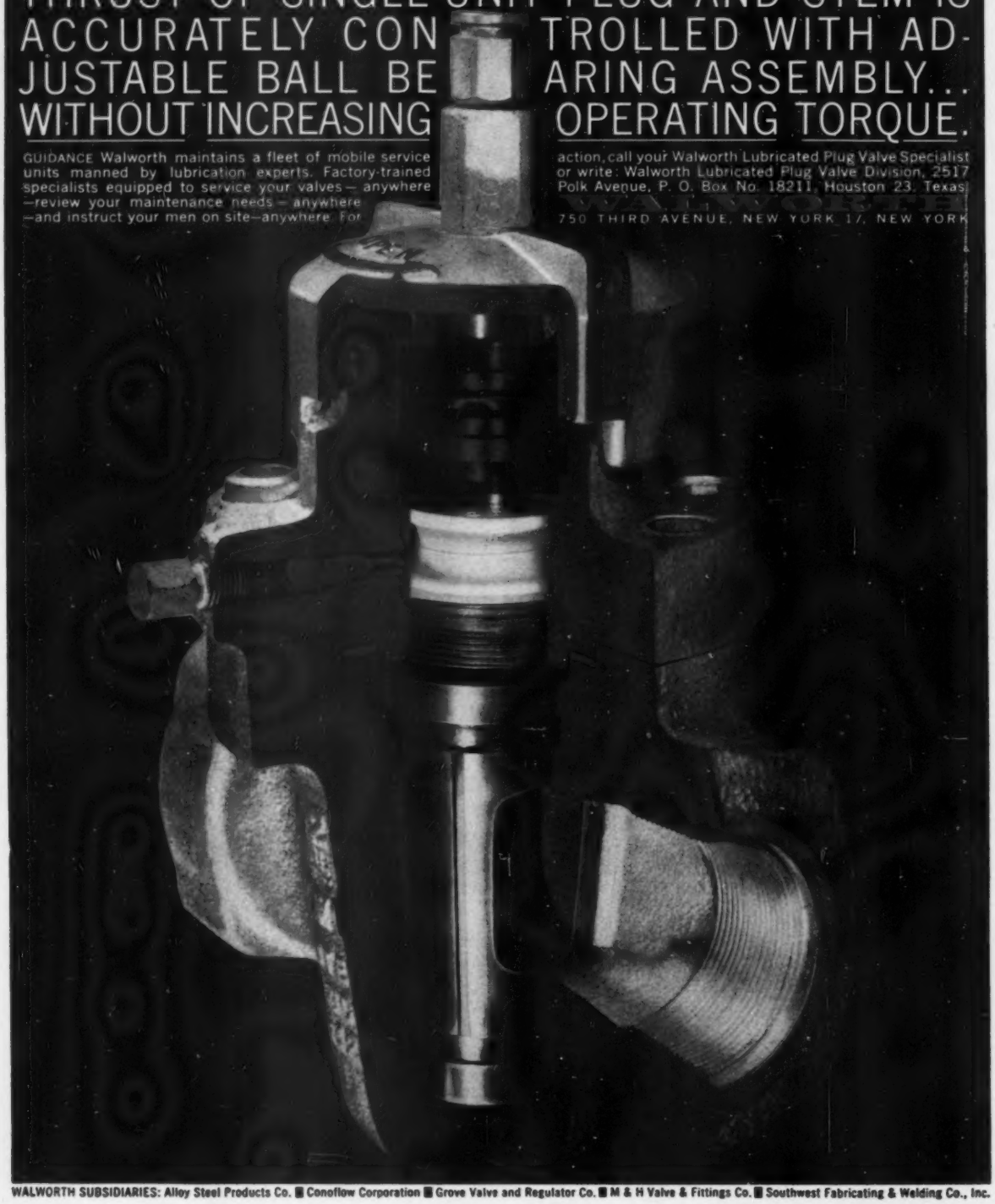
CLEVELAND TRENCHER

THE CLEVELAND TRENCHER CO., 20100 ST. CLAIR AVE., CLEVELAND 17, OHIO

MAKES THIS THE EASIEST OPERATING HIGH PRESSURE LUBRICATED PLUG VALVE YOU CAN FIND. UPTHRUST OF SINGLE-UNIT PLUG AND STEM IS ACCURATELY CONTROLLED WITH ADJUSTABLE BALL BEARING ASSEMBLY... WITHOUT INCREASING OPERATING TORQUE.

GUIDANCE Walworth maintains a fleet of mobile service units manned by lubrication experts. Factory-trained specialists equipped to service your valves— anywhere —review your maintenance needs — anywhere —and instruct your men on site—anywhere. For action, call your Walworth Lubricated Plug Valve Specialist or write: Walworth Lubricated Plug Valve Division, 2517 Polk Avenue, P. O. Box No. 18211, Houston 23, Texas

750 THIRD AVENUE, NEW YORK 17, NEW YORK



WALWORTH SUBSIDIARIES: Alloy Steel Products Co. ■ Conoflow Corporation ■ Grove Valve and Regulator Co. ■ M & H Valve & Fittings Co. ■ Southwest Fabricating & Welding Co., Inc.

Here's what's in the GEM program for the GAS INDUSTRY

. . . for you, a powerful advertising program resulting from the combined efforts of 17 companies supplying the gas industry. GEM—the Gas Equipment Manufacturers—sponsors a year-round program of advertising in leading magazines read by home owners. The large, colorful ads promote the consumer use of gas for major household equipment.

Gas utilities may have, free of charge, GEM newspaper mats of attractive ads designed to encourage the use of gas-fueled appliances. Available at cost are GEM direct mail pieces which may be sent to your customers. Write to GEM.

As a supplier to the gas industry, your company can increase the value of its services by participating in the GEM program. You are cordially invited to join us. For information, write to the GEM Committee, *60 East 42nd Street, New York 17, New York.*

These Suppliers to the Gas Industry Sponsor the GEM Advertising Program.

American Cast Iron Pipe Co.
American Meter Co.
Cleveland Trencher Co.
Economy Governor Co.
Fisher Governor Co.
E. F. Griffiths Co.
Mueller Co.
Pipe Line Service Corp.
Reynolds Gas Regulator Co., Inc.
Rockwell Manufacturing Co.
M. B. Skinner Co.
The Sprague Meter Co.
Superior Meter Division
Neptune Meter Co.
The Tapecoat Co.
Union Switch & Signal
Division of Westinghouse Air Brake Co.
U. S. Pipe & Foundry Co.
Vulcan Division
Reeves Bros., Inc.

"WE'RE EQUIPPING ALL OF OUR METERS WITH REEVES-VULCAN SYNTHETIC DIAPHRAGMS"

Nicholas O. Boutzilo, Distribution Engineer
Richard Meyer, Meter Shop Leadman, at right

PEOPLES GAS SYSTEM
Tampa and Miami, Florida

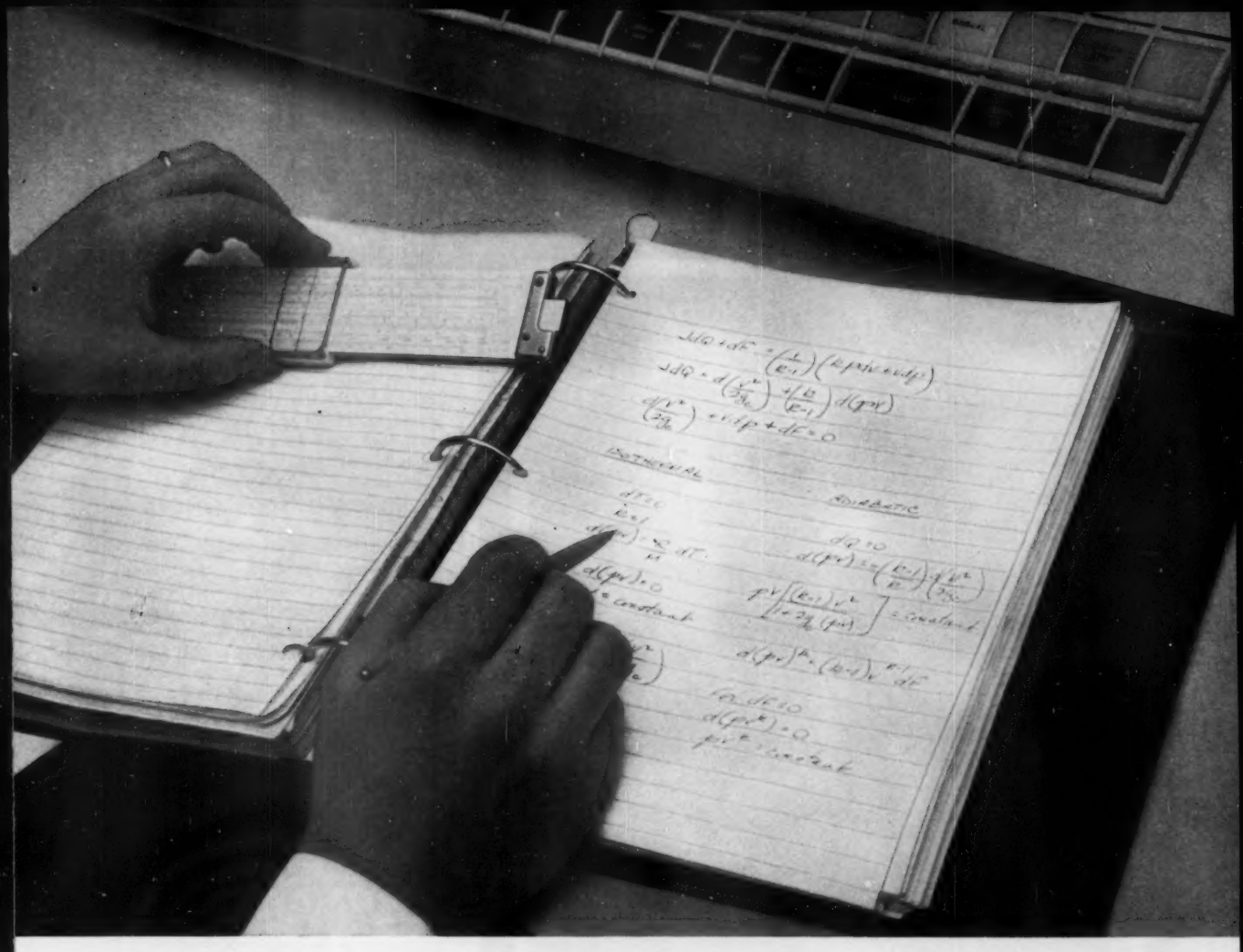
"When we converted to natural gas in 1959, two of our key plans were to improve metering accuracy and reduce meter maintenance costs," says Mr. Boutzilo. "We found we could do this by replacing leather diaphragms with Reeves-Vulcan synthetic diaphragms—in all new and replacement meters.

"During a three year change-out program on over 76,000 meters, we noticed that those still equipped with leather diaphragms had a tendency to run slightly fast. We therefore have discontinued purchase of any leather diaphragms. All meters and regulators are now being equipped with Reeves-Vulcan synthetics, at a rate of about 1000 a month.

"We've found that Reeves-Vulcan synthetic diaphragms last many years longer, and give us consistently accurate metering. They stay clean and never need oiling. They have reduced our meter maintenance costs considerably."

How about *your* metering efficiency? Improve it now with Reeves-Vulcan synthetic diaphragms. There's a model for practically every type of gas meter made. Both molded and crimped styles are available. Order from leading manufacturers or directly from: **REEVES VULCAN**

VULCAN DIVISION, 1071 Avenue of Americas, New York 18, N. Y.



Solve network analysis problems in minutes with the new low-cost IBM 1620

The new IBM 1620 Data Processing System carries out gas network analysis for as many as 750 pipes in low and medium pressure systems. It also evaluates much larger networks by carrying pipe data in a supplementary paper tape unit as calculations progress. You'll find the 1620 an economical investment for other reasons, too...

EASY TO USE—It takes only a two-day training class and you begin programming your own problems.

In addition, you get a wide range of free programming services including FORTRAN and GOTRAN. FORTRAN is the powerful scientific language that lets you solve problems without writing detailed computer instructions. GOTRAN is a simplified language (a sub-set of FORTRAN) that lets you enter simplified problem statements and data into the computer with the solution immediately available, in one simple operation.

FAST—The 1620 computer is so fast you can solve a set of ten simultaneous equations in only 20 seconds.

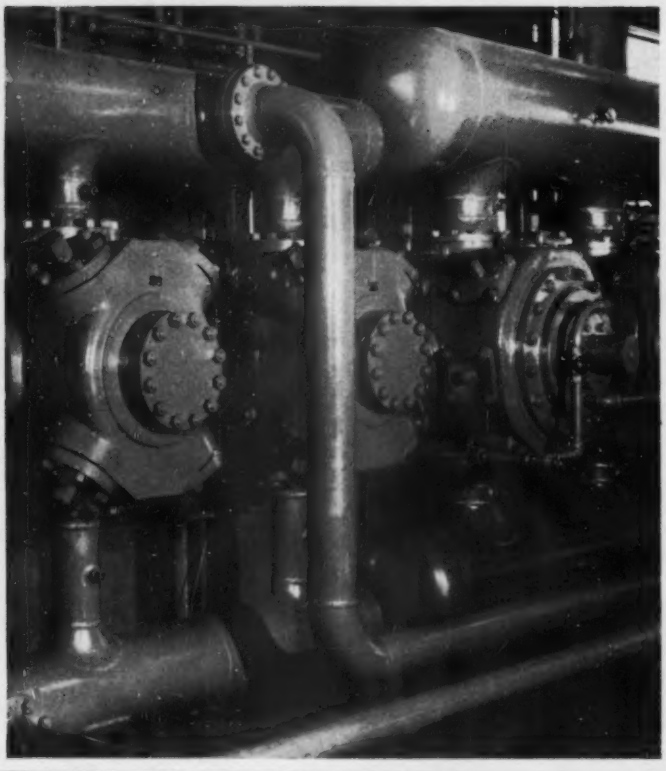
POWERFUL—The 1620 saves you time with many other complex problems—pipeline design and simulation—compressor performance studies—gas measurement—load trends—burner efficiency of gas—reservoir phase behavior.

GET FULL DETAILS—Find out how a small monthly investment can free you for more creative work. A basic 1620 solid state computer rents for just $1,600 a month. Call your IBM representative.

IBM's 1620 is a compact desk-size computer.

IBM®
DATA PROCESSING

PACKAGED
COMPRESSOR PIPING...



another example of

BONNEY
SWEEPOLETS®

for sophisticated
piping systems

Designed to eliminate all notch effects, the Bonney Sweepolet provides optimum stress distribution for critical piping systems such as the compressor bottles shown above on Worthington SLHC-10 gas engine angle compressors rated at 950 BHP each. These units were fabricated by Worthington-Lockett using Bonney Sweepolets for branch construction. Specify and use Bonney Sweepolets in your critical piping systems.

BONNEY

also exclusive manufacturers of
WELDOLETS®
THREDOLETS®
SOCKOLETS®
ELBOLETS®
BRAZOLETS®
SWEEPOLETS®
• • • • • • • • • • •
CARBON STEEL
STAINLESS
ALLOY
for all services

BONNEY FORGE AND TOOL WORKS
ALLENTOWN, PENNSYLVANIA

regulatory • *Cont'd.*

from page 12

Transco and Con Ed also argue that the commission is opposed to this transaction merely because it is a direct sale not subject to the commission's primary jurisdiction. A fair reading of the commission's opinion as a whole reveals that the commission did not exalt form over substance in an attempt to extend the scope of its jurisdiction. Whenever the commission discussed the non-jurisdictional nature of this sale, it tied this discussion into an analysis of one or the other of the substantive evils it was seeking to prevent—"inferior" use or increased prices to consumers generally.

The question for consideration in this section, therefore, is whether in a certificate proceeding the commission may consider the effect the inflated price charged in one sale will have on future field prices. We have recently answered this question in favor of the commission's jurisdiction. In CATCO we stated that the commission could decide whether: "The proposed price is not in keeping with the public interest because it is out of line or because its approval might result in a triggering of general price rises . . . ."

The Act contemplates comprehensive regulation in the public interest and the critical inquiry is whether Congress intended state or federal authority to govern.

The commission was concerned with the effects this Transco certification might have on future field prices generally. The commission considered not only the interests of consumers in New York but those in all states. To be compared with the problem before the commission are the determinations that a consuming state commission may make in exercising authority over a direct sale. The present problem, entailing considerations that overstep the bounds of any one state, illustrates the improbability that state commissions could deal with it. Considerations of this sort are uniquely fitted for federal scrutiny.

Congress intended to impose a comprehensive regulatory system on the transportation, production, and sale of this valuable natural resource. Therefore, when we are presented with an attempt by FPC to control a problem that is not, by its very nature, one with which state regulatory commissions can be expected to deal, the conclusion is irresistible that Congress desired regulation by federal authority rather than nonregulation. ■

SAFE, SIMPLE, SILENT GROVE FLEXFLOS®

FOR ANY PRESSURE REGULATING NEED

There's a complete line of Grove Flexflo regulators for pressure reducing and back pressure services. Flexflos can be supplied self-operated, pilot-operated or with Grove electric, pneumatic and hydraulic operators. A single moving part—a silently flexing rubber tube that can never slam, stick or wedge, makes Flexflos simple, dependable. The tube assures positive shut-off even though foreign matter may be trapped between the core and tube. In cast iron or steel; screwed end: 1" to 3", flanged end: 2" to 12". Control pressure ranges from 2 psi to 1500 psi.

GROVE REGULATORS

GROVE VALVE AND REGULATOR COMPANY

a subsidiary of Walworth 6529 Hollis Street, Oakland 8, California

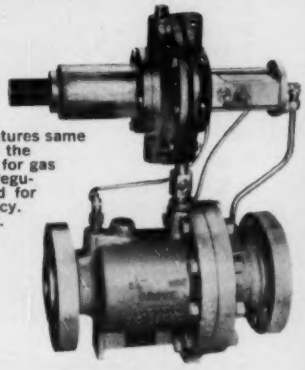
Offices throughout the U. S. and in Western Canada

GAS BACK PRESSURE FLEXFLOS

Model 888, self-operated, gas dome-loaded. Setting is fast, easy, without springs or pilots. Recommended for natural gas, air and liquids. Bulletin #888-D.

GAS PRESSURE REDUCING FLEXFLOS

Model 80-820 where extreme accuracy is critical. Sensitive, spring loaded model 820 Grove pilot is a diaphragm controlled, three-way throttling valve. Seven adjustable spring ranges from 2 psi to 1200 psi. Send for Bulletin #813-B.



Model 80-830 features same type of pilot as the 80-820, adapted for gas back pressure regulation. Designed for extreme accuracy. Bulletin #813-B.

Grove Sets Regulator Standards for Others to follow

Model 80-836A, designed for "pounds to ounces" pressure reduction. For inlet pressures to 100 psi and adjustable control ranges from 2 ounces to 20 psi. Bulletin 813-B.

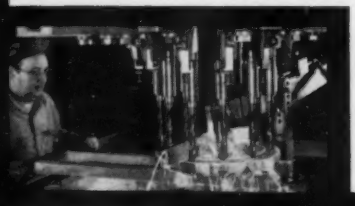
Model 80-833, for low pressure services. 833 pilot is available with three adjustable spring ranges: 10-30 psi, 15-75 psi and 25-150 psi. Bulletin #813-B.

7078

The Source for Better Service . . . a Better Product

B&W's New Fittings Plant is in FULL OPERATION

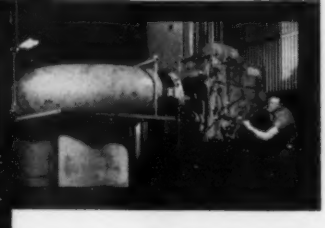
One of the mill stock bays.



Machining a B&W flange.

Forging a tee.

Packing fittings for shipment.



Machining a 24" elbow

The paint line.

The transfer of B&W's welding fittings operations from Milwaukee to Beaver Falls is now complete. In full operation is the newest, most modern source for welding fittings and flanges in the industry. In full operation is a welding fittings plant that is integrated with B&W's facilities for steel and tube-making.

In terms of practical benefits to you, this means:

- You can get a complete line of welding fittings and flanges, quality controlled at every step of the production process from melt to the finished product.
- You can get a complete process piping package . . . welding fittings, flanges and tubular products from a single source . . . job-matched to end-use service.
- You can more effectively coordinate and control specifying, buying and delivery from one manufacturer.
- You can get on-time deliveries because complete integration permits flexible production schedules, particularly in the specialized steels.

For further details on how B&W's new fittings plant with its integrated facilities and services can help you, contact any of the local B&W District Sales Offices or write The Babcock & Wilcox Company, Tubular Products Division, Welding Fittings Plant, P.O. Box 230, Beaver Falls, Pennsylvania.

B&W

THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

TA 1020 F

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

MORE MORE MORE MORE

MORE METER FOR YOUR MONEY

...and you can prove it.

Compare the capacity of the Superior AL340 with any hardcase meter you are now using in the 300-400 range. Check the performance curves, check the output, check the price.

Most meters show rated capacity when tested with ½" water column and 0.60 sp. gr. gas. All Superior aluminum case meters are rated with 0.64 sp. gr. gas. This is *extra* capacity.

Extra capacity, at no extra cost, stretches your "capacity dollar" and at Superior we're dedicated to providing more and better means for stretching your capacity dollar. That's why you should consider Superior for your metering needs. *You can specify Superior with confidence.*

neptune
for a better measure of profit

SUPERIOR METER DIVISION
NEPTUNE METER COMPANY
167-41st Street, Brooklyn 32, N.Y.

Branch Offices: Atlanta • Brooklyn
Chicago • Columbus • Dallas • Denver
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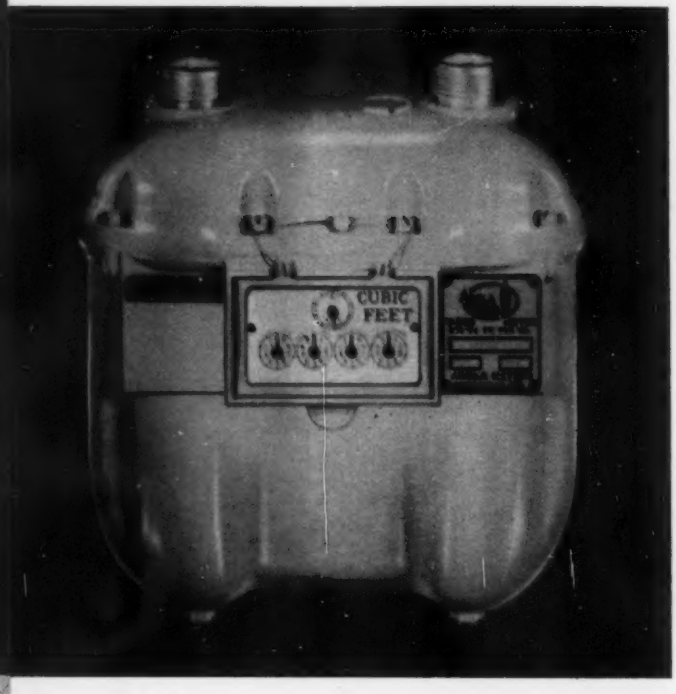
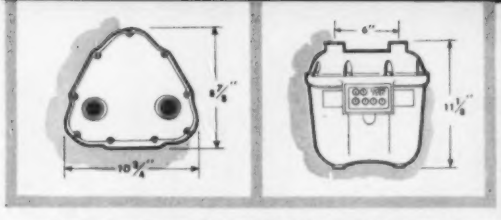
Kansas City, Mo. • Philadelphia Area
(Bala-Cynwyd) • Portland
In Canada: Neptune Meters Ltd.
Toronto • Calgary • Halifax • Montreal
Vancouver • Winnipeg

V 250





Dimensions: The Arkla V250 Gas Meter weighs less and is smaller than any other 250 cu. ft./hr. gas meter.

A NEW, COMPACT, ACCURATE "CASH REGISTER" FOR THE GAS INDUSTRY!

EXCELLENT ENGINEERING AND DESIGN of this gas meter, first of a new, modern line, are evident in its light weight and compactness that make the Arkla V250 Gas Meter easy to install... fewer moving parts reduce maintenance... accuracy of the Arkla V250 Gas Meter makes it a welcome "cash register" for the gas industry.

Order ARKLA V250 GAS METERS TODAY. *(Other models available soon.) For further information, write or call us, or ask your Arkla-Reynolds Gas Regulator representative.*

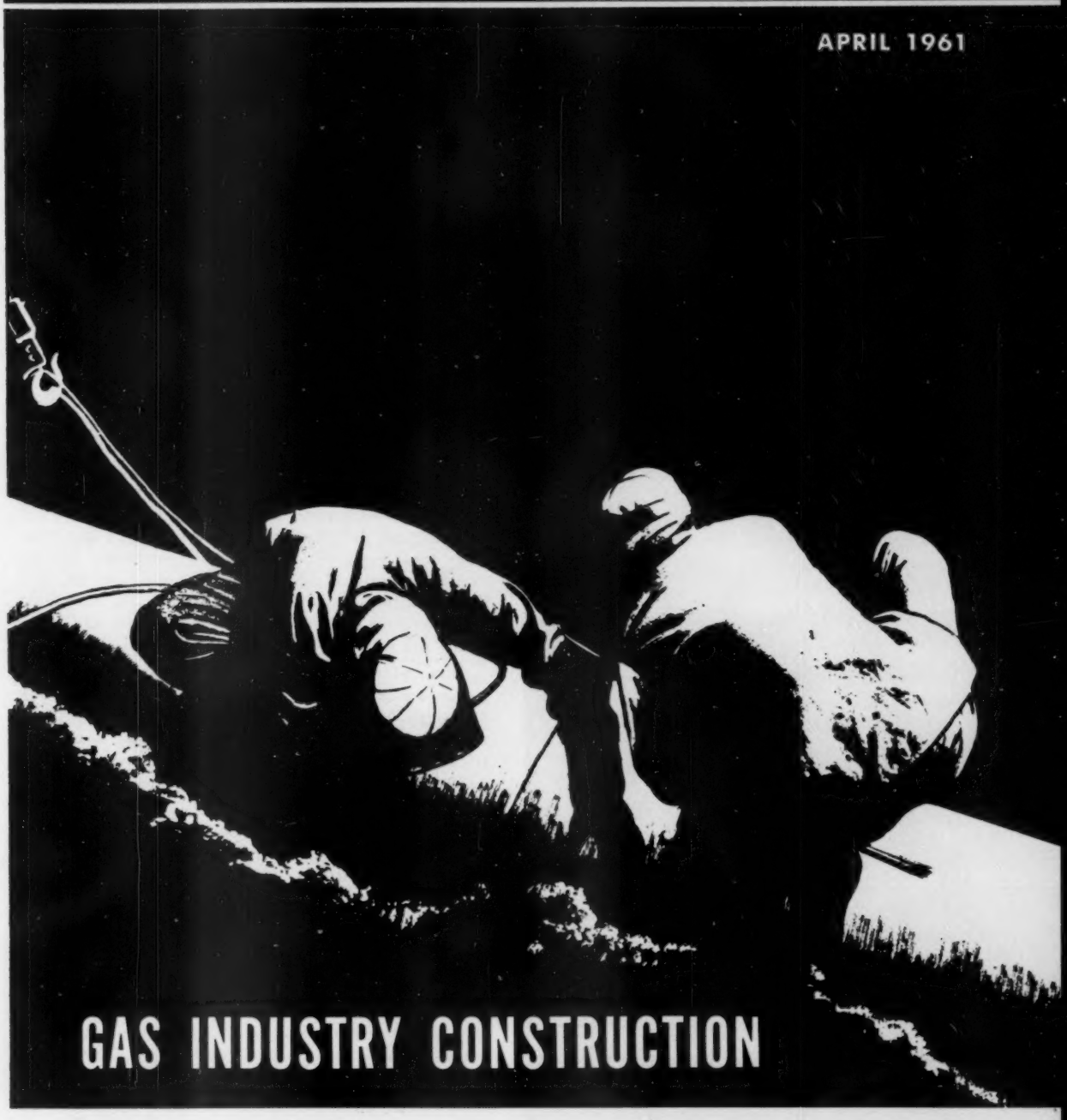
ARKLA

WRITE OR CALL:

A Division of Arkla Air Conditioning Corporation

GAS

APRIL 1961



GAS INDUSTRY CONSTRUCTION

CONTINUES AT $2-BILLION-PER-YEAR CLIP

detailed results of GAS' 14th Construction Budget Survey follow

begin on next page

GAS' 14th Construction Budget Survey Shows:

This year, 220 of the nation's major distribution, transmission, and integrated companies are investing $2,025,931,000. Of this total, $1,884,083,000 was itemized:

- $606,828,000 for basic distribution system,
- $960,278,000 for basic transmission system,
- $122,691,000 for storage-peak shaving,
- $101,152,000 for production and gathering,
- $73,488,000 for general expenditures,
- $19,646,000 for transportation and construction equipment.

This year's construction adds a total of 25,550 miles to these companies' gas piping networks:

- 11,854 miles of new and replacement mains,
- 8,501 miles of new and replacement service lines,
- 5,195 miles of new and replacement mainline pipeline.

By ROBERT CLAY • Managing Editor

WITH words like "recession" and "record unemployment" ricocheting off office walls in the American business community, how is the gas industry progressing in '61? Fine! GAS Magazine's 14th annual gas industry construction budget survey shows that for the fifth straight year, the industry plans to invest more than $2 billion in improving and expanding its facilities.

While this "business as usual" behavior cannot help but have a stabilizing, even morale-building influence on the American economy, it is being credited in some circles with a more immediate, curative effect. A highly respected independent economic consultant service describes "the recent performance of the steel industry" as "the ray of hope in the current business picture." In the same breath, it credits gas transmission sales as one of the factors boosting steel output, line pipe being listed among the items "perking mill operations." Thus, the gas industry is both shrugging off popular economic trends and helping lead the rest of the nation out of an economic slump.

Two-hundred-twenty of the nation's major distribution, transmission, and integrated companies are in the '61 construction survey. That's six fewer companies than replied before last year's survey deadline. Two factors unquestionably slowed up the returns this year because they slowed up gas company final budgets: the unsettled economic picture and the more-confused-than-ever regulatory picture. The inevitable result is that—while 36 individual items are up over last year—some items and some totals are not up.

Total '61 appropriations budgeted by the 220 companies add up to $2,025,931,000. Of this grand total, $1,884,083,000 or all but $141.8 million, was earmarked for one of six main categories: basic distribution system, basic transmission system, storage-peak shaving, production and gathering, general expenditures, and transportation and construction equipment.

Two of these categories, storage-peak shaving, and general expenditures, show really substantial increases over last year's figures, both being up around 20 per cent.

The actual totals for each of the categories are: basic distribution system, $606,828,000; basic pipeline system, $960,278,000; storage-peak shaving, $122,691,000; production and gathering, $101,152,000; general expenditures, $73,488,000; and transportation and construction equipment, $19,646,000.

At the end of this year, how will these figures compare with what was actually spent in '61? They will prove to be most conservative, as will all other figures in this survey. One reason, already indicated, is that $141.8 million included in the survey grand total was not earmarked for specific categories. A second reason is that a few of the large companies did not complete their budgets before the survey deadline; and they, of course, are not included. A third reason is that—while the 220

companies in this survey constitute the vast majority of the industry's customers and investment—some 1200 small companies are not included.

Some clue to the complete picture is afforded by the annual AGA forecast, which also usually proves to be conservative. The AGA estimate is that total industry investment this year will be $2,219,000,000. Included in this total are: distribution, $739 million; transmission, $1060 million; production and local storage, $235 million; underground storage, $101 million; and general, $84 million.

Before taking a closer look at each of the six main categories to examine the individual items, one thing must be clearly understood: all figures for individual items are grossly conservative. Of the $1,884,000,000 earmarked for the six main categories, only $1,388,300,000 was itemized to show expenditures for each of the individual items in the category. Thus, if the unitemized and/or uncategorized $638 million included in the survey total were spent in exactly the same fashion as the categorized, itemized $1,388,300,000; the expenditure for each of the items listed below would be increased by 45.9 per cent.

And if the AGA-forecast of $2,219,000,000 were spent in exactly the same fashion, each of the individual items would be multiplied by 59.8 per cent.

Bearing that in mind, let's look at those six main categories:

BASIC DISTRIBUTION SYSTEM—$606,828,000—The very heart of the gas industry, its basic distribution system, is adding more than 20,000 miles of new and replacement pipe during the current year. Included in this figure are 11,854 miles of mains and a record 8501 miles of service lines. The latter figure is 4.6 per cent above the comparable '60 figure. Dollarwise, the service line increase is $3.97 million (2.9 per cent), bringing '61 service line expenditures to $140.69 million.

Of the seven individual items showing increases in the distribution category, the largest increase, both from percentage and dollar viewpoints, is for domestic service regulators. Expenditures for this item are up 51.6 per cent, or $4.43 million, to $13.01 million.

Other substantial increases in this category are: domestic meters, up 2.9 per cent to $48.10 million; non-domestic meters and measurement equipment, up 18.9 per cent to $11.31 million; non-domestic pressure regulation equipment, up 15.9 per cent to $9.24 million; cathodic protection, up 13.9 per cent to $3.49 million; scrubbing and cleaning equipment, up 10.4 per cent to $634,000.

Biggest single item in this category continues to be mains, in which the surveyed companies said they'll invest $306.79 million.

BASIC TRANSMISSION SYSTEM—$960,278,000—If the distribution system is the industry's heart, the pipeline system is its lifeline. Pipeline or lifeline, the state of health is fine, with the largest item showing a really good gain and two others showing spectacular gains.

'61 Expenditures Are Up For 36 Separate Items:

BASIC DISTRIBUTION SYSTEM

New and Replacement Service Lines—Up 2.9%
Domestic Meters—Up 7.2%
Service (house) Regulators—Up 51.6%
Meters & Measurement Equipment—Up 18.9% (other than domestic)
Pressure Regulation Equipment—Up 15.9% (other than domestic)
Cathodic Protection—Up 13.9%
Scrubbing & Cleaning Equipment—Up 10.4%

BASIC TRANSMISSION SYSTEM

New & Replacement Pipeline—Up 13.4%
Measuring Stations—Up 100.4%
Dehydration & Scrubbing Equipment—Up 45.3%
Cathodic Protection—Up 7.5%

STORAGE—PEAK SHAVING

Natural Gas—Wells—Up 77.3%
Natural Gas—Wellhead Equipment—Up 20.6%
Natural Gas—Compressor Stations—Up 47.1%
Natural Gas—Measuring & Regulating Equipment—Up 17.1%
Natural Gas—Dehydration & Scrubbing Equipment—Up 2.8%
Natural Gas—Automatic Control Equipment—Up 181.2%
LPG Tanks (bulk storage)—Up 27.0%
LPG Plant Equipment (misc.)—Up 21.0%
Manufactured Gas Plant—Up 79.9%

PRODUCTION & GATHERING

Exploration—Up 44.6%
Drilling—Up 30.2%
Field & Gathering Lines—Up 40.3%

GENERAL

Communications—Mobile—Up 80.1%
Communications—Microwave—Up 33.4%
New Conventional Buildings—Up 26.6%
New Prefab Buildings—Up 29.5%
Office Systems & Equipment—Up 67.6%
Shop & Lab Equipment—Up 5.2%
Tools & Work Equipment—Up 10.0%
Gas Quality Control Equipment—Up 9.5%

TRANSPORTATION & CONSTRUCTION EQUIPMENT

Automobiles—Up 2.0%
Service and/or Pick-up Trucks—Up 24.1%
Light Construction Equipment—Up 29.2%
Heavy Construction Equipment—Up 3.8%
Air Compressors—Up 16.2%

That largest single item is the pipelines, themselves. With construction plans calling for 5195 miles of pipeline this year, the surveyed companies plan to invest $491.19 million for this one item. That's an increase of $58 million, or 13.4 per cent.

Those spectacular gains are 100.4 per cent in measuring stations and 45.3 per cent in dehydration and scrubbing equipment. The $5.03 million increase in measuring stations more than doubles last year's figure, the '61 expenditures totaling $10.03 million. Dehydration and scrubbing equipment spending is up $761,000 to $2.44 million.

Not as spectacular, but still a good gain, cathodic protection budgets are up 7.5 per cent to $2.60 million.

Compressor stations remain a big item—the second biggest—in this category. The surveyed companies have earmarked $91.78 million for this item.

STORAGE — PEAK SHAVING — $122,691,000 — This is one of the two major categories showing an increase this year. The gain is 21.1 per cent or $21.42 million.

Since the items in this category can be divided according to the three fuels with which they are concerned, and since increases are registered in all three cases, this category can be observed as three sub-categories.

The largest sub-category, naturally, is natural gas with a total of $46.42 million itemized and six of the seven items showing increases, some very spectacular. Specific percentage increases and the amount budgeted for each item: wells, up 77.3 per cent to $21.71 million; wellhead equipment, up 20.6 per cent to $3.16 million; compressor stations, up 47.1 per cent to $13.28 million; measuring and regulating equipment, up 17.1 per cent to $842,000; dehydration and scrubbing equipment, up 2.8 per cent to $1.23 million; and automatic control equipment, up 181.2 per cent to $537,000. Total increase for this category was $10.71 million, an even 30 per cent gain.

For LPG peak shaving, $10.91 million is earmarked, a 23.3 per cent increase. The only specific item in this category, bulk storage tanks, is up 27.0 per cent to $4.40 million.

Manufactured gas plant equipment investments, up an amazing 79.9 per cent, total $5.36 million.

PRODUCTION AND GATHERING—$101,152,000 —While this category total does not show an increase, its three largest individual items—exploration, drilling, and field and gathering lines—all show substantial gains.

The biggest dollar item, field and gathering lines with total expenditures of $39.17 million, shows the biggest dollar increase, $11.25 million. That's a 40.3 per cent gain.

The second biggest dollar item, drilling, is up 30.2 per cent to $24.24 million. The third biggest dollar item, exploration, shows the biggest percentage gain, 44.6 per cent. In dollars, that's $1.86 million, bringing total exploration-earmarked funds to $6.03 million.

GENERAL EXPENDITURES — $73,488,000 — The second major category showing an increase, general spending is up 19.4 per cent or $11.96 million. The accent is clearly on three types of items: buildings, office equipment, and communications.

The largest dollar increase, $6.39 million, is for new conventional buildings. The total so budgeted is $30.38 million, a 26.6 per cent gain. A slightly higher percentage gain, 29.5 per cent, brings new prefab building expenditures to $778,000.

Office systems and equipment present the second highest percentage gain in the category, 67.6 per cent, and the second highest dollar increase, $2.39 million. The total budgeted for this item is $5.94 million.

Lumping all types of communications equipment together, we find a general increase of 51.8 per cent. Included are: microwave, up 33.4 per cent to $1.830 million, and mobile radio, up 80.1 per cent to a near-identical $1.828 million. The latter percentage increase is the largest in this category.

This was the only category in nich all items showed an increase. The others rounding out the picture are: shop and lab equipment, up 5.2 per cent to $1.16 million; tools and work equipment, up 10.0 per cent to $4.87 million; and gas quality control equipment, up 9.5 per cent to $551,000.

TRANSPORTATION AND CONSTRUCTION EQUIPMENT—$19,646,000—More than any other category, this one shows simply and directly the pronounced difference between the gas industry and the American economic community. The commodities are the same but the sales curves are very different.

Automobiles, the bellwether of the business world, are having their worst sales year in a decade with production reduced to the material-scarce levels of the Korean War years. Yet, the gas industry this year is increasing its spending for autos by 2.0 per cent. The increase is not high, but may very well be the only large industry to show any auto purchasing increase at all. Total amount earmarked for cars is $4.10 million.

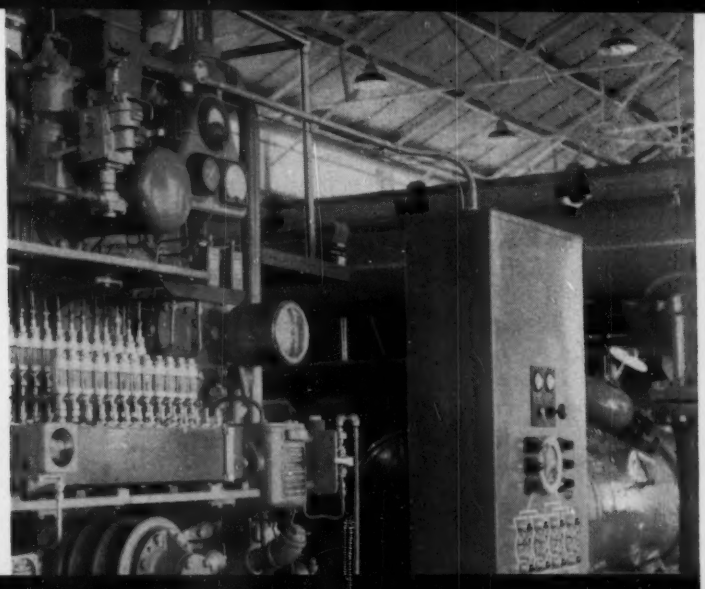
A much more spectacular increase is shown in the service truck and light truck field. Here, the gain is an amazing 24.1 per cent and the total is $4.53 million.

Good gains are also revealed for construction equipment. Light construction equipment is up 29.2 per cent to $1.90 million while heavy construction equipment is up 3.8 per cent to $1.80 million. Air compressors gained 16.2 per cent, now stand at $1.22 million.

The only conclusion to be drawn from all these figures is that—despite an acknowledged economic slowdown—the gas industry is progressing at an "expansion-as-usual" pace; that the gas industry is in a much more healthy state than almost all other industries.

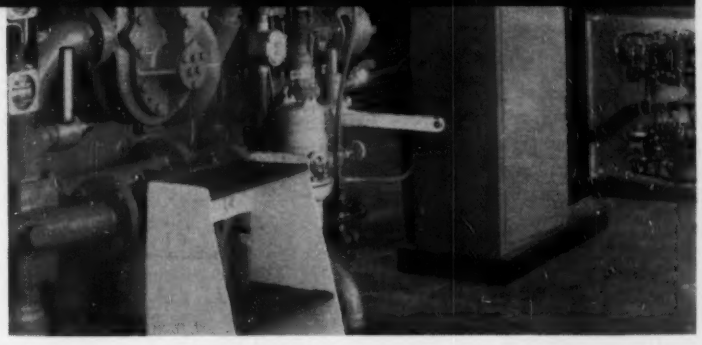
For those interested in a highly detailed, item-by-item analysis of this survey, *GAS* is preparing a special report. It will be available in a few weeks. For a copy, write Dept. M, GAS Magazine, 198 S. Alvarado St., Los Angeles 57. ■

A study in depth of



automation in gas industry operations

By KEN KRIDNER



Control equipment installed at Colorado Interstate Gas Co.'s Springfield (Colo.) compressor station. This system will be reviewed in the article scheduled to appear in the June issue.

This publication has retained an outstanding consultant, Ken Kridner, to travel and spend the time necessary to compile a valid study of the subject. Results will be available to GAS' readers in a series of articles to be published during the following months. Here is the introduction to the series.

"WHAT is the state of the art of automation today in gas distribution and gas pipeline operations?" This question posed to me one day early in January by GAS' editor triggered an extensive study of gas company operations across the nation to search out the facts for a series of articles to be presented to readers of GAS Magazine. The initial report will be brought to you in the May issue of GAS.

Currently, managements of gas distribution and transmission companies are evaluating reports prepared by engineering staffs and are reviewing operating data available from existing automated facilities to determine the future applications of

Ken Kridner is a chemical engineering graduate of Rice Institute (now University) in Houston. His entire life has been closely associated with the gas industry. Kridner was formerly with Colorado Interstate Gas Co., specializing in gas measurement and control-automation conceptualization and design. He has just returned from Argentina, where he supervised design and construction of several phases in the creation of that country's huge new natural gas systems complex.

Comments on the series of articles or communications to the author can be addressed to GAS' editor, 198 S. Alvarado, Los Angeles 57, Calif., or to Kridner personally at Box 193, Woodsboro, Texas.

automation in their own operations. In this series of articles, we will endeavor to bring the status of applied automation in the gas industry today to focus for the man on the job as well as for those in top level positions. And, we will attempt to forecast the trend for future projects.

To make this study, GAS sent me on a coast-to-coast trip. I have talked to well-informed, experienced personnel of leading gas companies all over the U. S. I have made on-the-spot investigations of facilities installed and operating under automation as we see it today. Particular emphasis was placed on preparation of an itinerary for this tour so as to include those companies that have been to the forefront in adoption of the current-day philosophies of an automated system.

I believe it would be well to review those operations in gas distribution and transmission that are most applicable to adaptation of automatic controls.

The use of automatic controls does not constitute a new front in the gas industry. Many items of hardware such as regulators, thermostats, valve operators, etc., have been around for many years. Yet, when such items are included in the overall philosophy of automation, they become part and parcel of system automation. Automation becomes then not simply the use of one or two items of automatic control hardware, but rather the inter-related use of automatic controls to accomplish an end result without manual supervision. The object under control may well be an engine, a compressor station, a meter station, a trunkline system or a high Btu oil gas plant.

It is undoubtedly true that timing is very important if an automated system is to be incorporated in the properties of any company. Installation of necessary control hardware on a new system is considerably less expensive than modification of an existing facility. For this reason, adoption of automation by gas transmission companies has proceeded at a slow pace and has been limited principally to facilities constructed in the last few years. Witness, for example, the installation of the automated compressor stations by Columbia Gulf Transmission Co. and Transwestern Pipeline Co. Transwestern benefitted from engineering experience gained through the Columbia Gulf installations and is undoubtedly the most advanced automated system in operation today.

It is interesting to note that the Federal Power Commission took cognizance of "satellite" compressor stations in its Release No. 8539 of June, 1956, which said, in part: "The Federal Power Commission authorized Gulf Interstate Gas Co. of Houston, Texas, to make its experimental unattended 'satellite' natural gas compressor station near Stanton, Ky., a permanent part of its facilities."

And again in the examiner's decision on the Transwestern application which was approved by the commission on Aug. 10, 1959, which said, in part: "The proposed Transwestern facilities are designed for automatic operation and, according to the record herein, all presently known economics in pipeline design and operation have been incorporated into this system." It is thus evident that FPC commissioners have taken note of automating new pipeline facilities, and have accepted the philosophy of a well engineered system and recognized the possible affect of an automated facility toward increased effi-

To be discussed in May is the new facility of Public Service Electric & Gas Co., Newark, N. J. Shown here is the dispatch center.

ciency of overall operation.

There arise the problems inherent to obsolete and outmoded equipment in attempting to adapt existing facilities to automatic operation. Some compressor units, for example, simply are not adapted to unattended operation. At the same time, these units are normally experiencing high operating cost and low efficiencies. This may be particularly true of the older horizontal compressor units.

It would appear as a practical measure that older units might be considered obsolete and replacement of such facilities considered on a planned retirement program. Such a retirement program of "obsolescence" would strive to accomplish increased return through improved efficiency of operation. There appears to have been no case presented before FPC in recent years whereby a company has proposed periodical replacement of older equipment.

Such replacement of older compressor units could have a two-fold effect on the gas industry and its related manufacturing suppliers. First, it would tend to increase efficiency of operations and thereby improve performance of gas delivery to the market area. And, secondly, it would provide an added incentive to engine manufacturers to constantly improve their product through expansion of the market for their products. This latter phase is of particular interest in the gas industry, where a facility once installed is permitted to remain until the investment has been written off. This same obsolescence program might be extended to other items such as meters, valves and regulators.

The American Gas Association recently announced establishment of an Automation Committee of the Operating Section under the chairmanship of Neal B. LauBach, vice president of operations of Colorado Interstate Gas Co. The scope of the committee's function, as outlined by Stan Setchel of the AGA Operating Section, will be to collect and disseminate information, to make recommendations for the application of, and to suggest research projects pertaining to automation.

AUTOMATION—GAS DISTRIBUTION COMPANIES

The principal interest in automation for gas distribution companies lies within the areas of maintaining an adequate supply of gas to meet the consuming public's requirements, and guarding against excessive purchase cost due to penalty provisions in purchase contracts. This latter item can be very costly in a company's operations should excessive takes on a peak day result in application of the penalty clause pertaining to billing demand. In other instances, distribution companies may be purchasing gas from a multiple number of sources where considerable economic advantage can be experienced through selective takes; purchasing gas from a source having lower prices or accepting only the minimum volume necessary to meet a contract demand.

The basic operation of a gas distribution company involves: (1) acceptance of natural gas at city gates, supervising flow characteristics and pressure conditions, (2) dispatching gas through interlaced distribution mains, (3) controlling pressures in the sys-

tem through operation of district regulators, and (4) attempting to level-out peak demand periods by withdrawal from storage. In addition, there are the many problems related to domestic metering and customer billing.

Past operating procedure has seen the distribution company operate with a large number of personnel spread through a city network. These people called in orally to a dispatching center information for each purchase point as to pressure, differential pressure and temperature for each orifice meter; and, pressure information for critical system points and sales areas. Dispatching personnel were then required to labor through a volume of calculations to arrive at necessary flow data to permit issuance of instructions for gas purchase, pressure control, or routing. Often, according to the men who performed this function, calculations were completed just in time to start the sequence again. Therefore, there was little or no proper dispatching being done. True, and it is to the credit of the personnel and their tenacity to do a good job, instructions were issued based on data that was available.

With the advent of telemetering and its acceptance by many of the distribution companies, the continuity and accuracy of data received was improved. The art of dispatching became more effective. Initially, only the elements of flow computation were telemetered and recorded in central office. It was still necessary for a dispatcher to make the tedious calculations. There remained a need for a device to receive, calculate and tabulate or print out the flow data. Then, the dispatcher could merely review the data on hand before arriving at a decision. Thus, the dispatcher becomes an important analyst of operations who can utilize his past experience to make the best decision from data presented.

Latest adaptations in gas distribution operations are advanced telemetering systems equipped with the necessary hardware to permit display and printout of flow conditions and pressures in the dispatcher's office. Several of these systems utilize high-speed computers programmed to span a large number of points on the system periodically. The computers then perform desired calculations and combine data which result in improved dispatching. The same computers are designed to automatically enter into an off-line program during intermittent periods when scanning or calculations for the dispatcher are not being performed.

A device that has found wide acceptance in the distribution field, and which lends itself to future automated system operations, is the remote-set pilot for pressure regulators. By use of this device, a dispatcher can transmit a signal to the pilot for an increased or reduced pressure and then by observing pressure recorders indicating the downstream pressures, have an immediate visual indication of the effect of the change. At present, this increase or decrease in pressure set-point is performed by depressing a contact manually and obtaining a specific increase or decrease in pressure. This will probably be adapted in the future for a feed-back operation deriving instruction from an overall system controller.

One of the many tools serving the gas distribution engineer and being utilized by several companies is the McIlroy Fluid Network Analyzer. In essence, it is an analogue computer that draws a direct analogy between an electrical and fluid system. Thus, it simulates steady state conditions in a network of piping. Flow is represented by current, pressure drop by voltage drop, and pipe section characteristics by special type vacuum tubes. Said Dr. Sheldon L. Levy and Leon D. Findley of the Midwest Research Institute of Kansas City, Mo. in the June 1959 issue of *Consulting Engineer:* "A recent test on the (McIlroy) Analyzer indicates the operating speed of this unique instrument. In one day, including the time to set up the problem, the flows and pressure drops in 70 trunk mains of a municipal water distribution system, supplied from five sources, were readily determined. The following day, 6 alternative conditions, with various reservoir elevations and sets of loads, were studied. This work subsequently led to the approval of a large construction project based on the computer data." Likewise, the flow problems related to low and high pressure gas distribution systems may be resolved.

Other companies are using electronic digital computers to resolve complex distribution system problems through utilization of a computer program resolving the modified Hardy-Cross equation. There appear to be very distinct advantages in the utilization of each procedure.

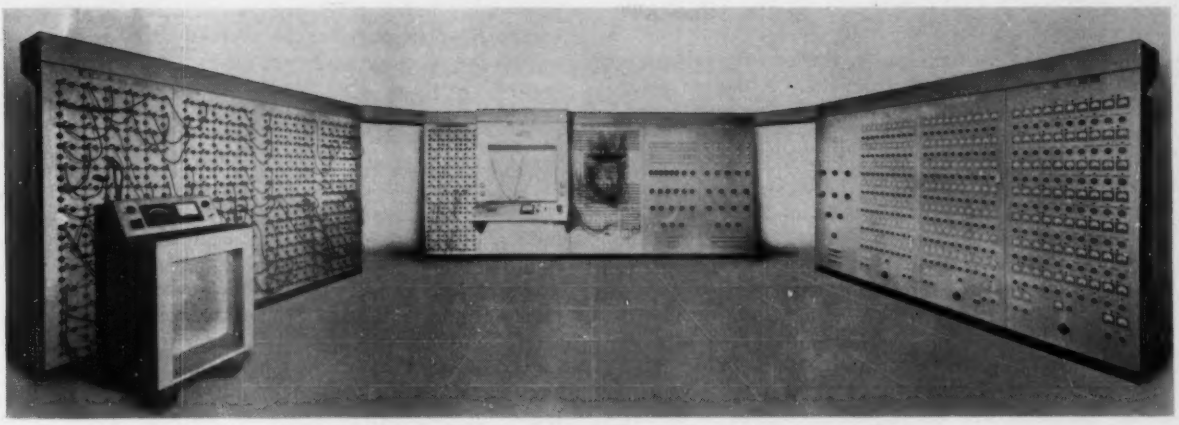
AUTOMATION—GAS TRANSMISSION COMPANIES

The system facilities of a gas transmission company would normally include one or more input volume sources, a gas trunkline system, a multiple number of compressor stations and finally, one or more sales outlets. The communications linkage used might be leased line facilities, company-owned wireline facilities, or a company-owned microwave system. In order to automate the system, there should be a predetermined program of introducing hardware into existing facilities to insure proper merging with future requirements.

There are a number of people who will claim that the gas pipeline segment arrived at automation of its compressor stations through accident rather than through design. This develops from the industry's use of supercharged and turbocharged engines which are more difficult to start and for which sequential start-stop panels were designed. It is interesting to note that very few of the older engines have been equipped with the panels. The advent of sequential start-stop panels initiated a normal second step in the process. That is, station control.

At first, station control was accomplished by performing the necessary control of start-stop and speed regulation from a remote location. However, this concept has given way to making each compressor station a self-contained operation. A self-contained station requires only a single instruction from a remote source and then, through programming of local control hardware, will increase or decrease speed and will start or shutdown units as necessary.

The principal subjects of discussion among personnel within a company organization considering



SoCal's McIlroy fluid network analyzer will be discussed in May.

station automation are the type and amount of data that should be brought from a controlled station and the instructions that should be sent to it. The decisions will vary from company to company as to data required from the station; however, the prevalent opinion for control is a signal for discharge pressure alone. Station hardware accepts this pressure set-point, checks the existing station discharge pressure and then emulates a signal to an engine selector, the engine governors, and to mechanisms that adjust compressor pockets to accomplish the desired pressure. Necessary safety devices are placed on the engine and in the station to afford protection of equipment. In event of loss of communications, a "fail-safe" condition would have the station continue to operate on the last transmitted signal, depending on safety gear to protect compressor units and station in the event of a malfunctioning condition.

The ability to interlace compressor stations on a system so a feed-back instruction would be transmitted to individual compressor stations appears, at this time, to be dependent on resolving transient flow conditions into a simplified logic. Several companies have undertaken this project. And recently one or more had broken through to come up with a computer program. It will now be necessary for this program to be resolved for high speed resolution on a simplified control type of computer.

Gas transmission companies have been well known for their reliance upon telemetered information. A large number of such companies use very extensive systems. Data transmitted over both leased lines, or company-owned wireline or microwave systems have included such basic information as flow components of static pressure, differential pressure, flow temperature, flowing gravity and heat content; and, in addition, pressure information from strategic points. In general, the components of flow are transmitted as pressure per square inch gauge, inches of water and degrees Fahrenheit. Calculation of volume is performed by personnel at a dispatching center. However, several companies are using more refined equipment which permits flow calculations to be made in the field and the volume transmitted as percentage of station capacity in use. Several companies are using printout and data logging equipment so that telemetered information is logged either on a periodic or demand basis.

There is no indication that any company has advanced to a point in its utilization of telemetered volume information where volumes so telemetered are used for billing purposes. To utilize telemetered data for billing would require data received to check very closely with the volume computed from a chart removed from the meter. With equipment available at this time, there is no reason to believe that telemetered information at the reception point would not be identical with data entering the transmitter. Orifice meters using square-root cams have long been accepted for determining the true extension for a meter, even in those instances of extreme pulsation.

The current procedure is to telemeter only the most important volumes, usually from larger sales and purchase points. With enlargement of microwave systems, it may be feasible for companies to bring in all of their system metered information and be in a position to interrogate and calculate on demand the volumes of gas entering or leaving their systems. The possibilities for this, both from billing and management data positions, are unlimited since through selective programming of an off-line accounting machine, cost data or day-to-day revenue information could be made available rapidly.

Two companies are utilizing system computers which are fed a minimum of data pertaining to conditions of flow and pressure, but resulting in conditions at various points throughout the system being rapidly obtained. This computer operates on the principle of analogue computers.

At this time no company has attempted to close the loop in its operations and issue feed-back instructions automatically to its controlled compressor stations. However, as the problems related to transient flow are overcome, and with extension of telemetering and more accurate calculation of flows received, it is not difficult to foresee the day when a dispatch office will be the "hub of activity" in transmission companies.

IN SUMMARY

The entry of automation in the gas industry has come with relative little opposition. Although progress to date has been slow, it has been consistent. There are persons who are not in accord with the concept that their systems should be automated. They feel that automation to date is unproven, uneconomical and possibly unrealistic. This may also have been said of the Wright brothers flying contraption back at Kitty Hawk, yet the same disbeliever would be a loggerhead today.

Looking further into the realm of development: what executive wouldn't willingly accept a type of closed-circuit television with which he could confer from his office with counterparts half-the-world away, retaining the all important senses of seeing and hearing? This certainly is not in the realm of fantasy as we see the latest experiments in the nation's satellite program to improve communications. Or, who is to say that the current "moon-shots" may not result in an improved transportation system for the earth.

Progress and prosperity have had a strange affinity for one another in our economy.

Whether we care to call the improved operating procedures being developed "automation," "systems control," or some yet to be evolved term, is merely a play on the part of semantics. An attempt to escape the word "automation" is unnecessary. The gas industry is in a position today where it has an implied and definite responsibility to John Q. Public for delivering natural gas uninterrupted and at the lowest possible cost of service consistent with prudent and efficient operating procedures. If in striving for the most efficient and economical method, a system of automatic controls is indicated, then the industry has a responsibility to its customers to do so. It would be difficult to find an average viewer of television who understands the theory and circuitry involved, nor is he interested. Likewise, the average gas user will fail to understand or care about the theory of facilities used on the automated gas system. But, he will be well aware of whether they work or not.

How far we have progressed toward the utilization of automatic controls in the distribution end of the gas business will be discussed in our article appearing in the May issue of GAS. A similar review of the gas pipeline segment will appear in the June issue. Another article covering latest equipment and hardware available will be covered in July.

IN RECOGNITION

The operations of gas distribution companies and the problems that are singular to their type of operations have always been of interest to me. I was delighted to have the opportunity to talk with Bruce McCannon of Public Service Co. of Colorado, in Denver, and hear of the interesting program they have devised for their Libratrol-500 computer.

Then my good friends in California, Ty Miller of Southern California Gas Co. and Maury Fuller of Pacific Lighting Gas Supply Co. Too, I have always been very intrigued by the possibilities of the McIlroy Analyzer at SoCal.

Northern Illinois Gas Co. of Bellwood, Ill., is currently installing an elaborate control system using a computer of Information Systems, Inc., with a speed of operation bordering the fantastic. Harold Schwalm of Northern Illinois was most cooperative.

Then there was Harry V. Precheur and Jeff Dave of Public Service Electric & Gas Co. of New Jersey who are rightfully proud of their latest developments.

In the gas transmission field, I had the opportunity to renew old acquaintance with Lee Fast of Southern Counties Gas Co. and review their southern system operations. In Colorado Springs, Colo., I discussed the system of Colorado Interstate Gas Co. with N. B. LauBach, one of the leaders in the automation field and chairman of the Automation Committee, Operating Section, American Gas Association.

Carlton C. Homan, Jr., of El Paso Natural Gas Co. was my next contact. Mr. Homan is another member of AGA's Automation Committee and an authority on automation in his own right. Said Mr. Homan in a paper given before the Winter ISA Automation Conference and Exhibit at St. Louis, Mo., Jan. 17-19, 1961—"We recognize today that the tools and hardware are available to automate a system. We have the reliable communications systems, remote control equipment, data transmittal devices, and we have reliable computers. The answer to our problem will be how and why to put these tools to use."

In Houston, Texas, the heart of the gas industry today, I talked with Sy Orlofsky, vice president of Columbia Gulf Transmission Co., the company that has one of the more automated systems in existence today; and with likable and very busy Bill Adams of Transcontinental Pipe Line Corp. On to Shreveport, home offices of Texas Eastern Transmission Corp., where I had a very enjoyable visit with Andrew Shoup, vice president and chief engineer, and, later, with Gordon Jennings, supervisor of plans and research, and a person whom I predict we will hear much from in the future. To complete the tour, I visited the offices of Columbia Gulf in Nashville, Tenn., where Dick Harrison explained the operations of their extended system, an item that I will elaborate on in the June issue.

I also had the opportunity to visit the offices of the Federal Power Commission in Washington, D. C., and had a very enjoyable discussion with Bill Webb of public relations and Carl T. Kallina, chief of bureau of rates and gas certificates.

To all of the above, and to the respective public relations personnel of their companies, and to others of the staffs in each company, I wish to say—"thank you." ■

ENERGY CONVERSION

is on its way

By ROBERT CLAY • Managing Editor

ENERGY conversion is one of the hottest subjects —both literally and figuratively—in the gas industry. Hot in a literal sense, some energy conversion devices operate at temperatures as high as 5000 deg. F and must be turned off after a few seconds operation to prevent them from burning up. Hot in a figurative sense, energy conversion is being investigated by countless companies and research groups. Some are spending huge sums for research and development. To cite one example of skyrocketing interest, Stanford Research Institute has received inquiries from some 90 companies interested in setting up new research projects in energy conversion.

Why this sudden excitement about something as prosaic as producing electricity?

Part of the answer lies in the space effort. In space vehicles, internal space and weight are critical. Instruments must be operated, but the power source must weigh an absolute minimum. For missile men, the prospect of turning waste heat into electricity without using moving parts is compelling.

But space requirements are only part of the story. Many engineers and scientists believe energy conversion can solve some of mankind's ever-present energy problems. Thus, much of civilization would profit from direct conversion of heat into electrical current. Members of the natural and L. P. gas industries would, of course, profit more than most, for the heat to directly produce electricity is best supplied by gas, either natural or L. P.

Currently, four devices turn gas energy directly into electricity without moving parts. They are: the thermoelectric generator, the thermionic converter, the fuel cell, and the magnetohydrodynamic converter. Each can be roughly or closely compared to a device now in common usage: the thermoelectric generator to the thermocouple; the thermionic converter to a vacuum tube, the fuel cell to a storage battery, and the magnetohydrodynamic converter to an automotive generator.

As a group, these four devices are potentially more efficient than steam or hydroelectric power sources. As individual devices, some show great promise of previously-undreamed-of high efficiency in a small package.

Experts are optimistic about energy conversion devices. At the West Coast unveiling of the natural gas fuel cell in mid-February, Dr. Martin Elliott of the Institute of Gas Technology, said: "It is probable that within the next decade, fuel cells will be used in many of the smaller power applications. After this, we may see more extensive application of fuel cells in larger power units."

At the same press conference, John Gayle of the Stanford Research Institute said: "It is conceivable that they (energy conversion devices) will be providing power that eventually will help light up the city of the future."

Gas people, of course, are even more enthusiastic. That West Coast debut of the fuel cell was staged by Southern California and Southern Counties Gas companies. The possibilities for the future were clearly spelled out by SoCal vice president Frank M. Foster: "The gas industry, as a whole, is on the verge of tremendous technological advances, advances which could change for the better the lives of all of us. The great progress that has been made in the field of converting natural gas into electricity certainly points up the possibility that the home of the future will have just one power supply—natural gas. Natural gas will continue to do the big jobs of heating and cooling your home, cooking, water heating, refrigeration, and clothes drying. But, electricity for such plug-in appliances as radios, TV and hi-fi sets, dishwashers, and other motors might well be generated in a natural gas converter no bigger than an ordinary suitcase."

Both Foster and SoCounties Vice President Frank Seitz emphasized that energy conversion devices have developed very fast, that future development can be so fast, and that so many companies are involved, that it's really hard to keep up with developments.

Right now, therefore, GAS presents a run-down of what has happened, what is happening, and what may happen to each one of the devices. Much of this material has been supplied by Gayle and Dr. Elliott.

THERMOELECTRIC GENERATORS

Thermoelectricity, or TE, appears to be the first direct heat-to-electricity method headed for widespread practical usage. Actually, it is already in widespread practical usage—for a limited application. The thermocouple, part of the control system used on many space heating installations, is an example.

Modern thermoelectric history begins in Russia. The late Dr. A. T. Joffe, director of Russia's Institute for Semiconductors, and widely recognized as the father of thermoelectricity, reported TE was one of the items included in the Soviet Union's first Five-Year Plan of the '30's. Russia early developed a radio powered by a kerosene lamp. When Dr. Joffe died, much of Russia's interest in TE died with him. Now, the United States is considered to be ahead in TE. However, it should be remembered that today there are thousands of old thermoelectric powered radios in both Russia and Mexico.

The revived American interest in thermocouples is due to recent advances in solid state physics, a result of work on transistors. Scientists began to understand thermocouples better and were thus able to improve them. They found that certain semiconductors can produce sufficiently large amounts of electricity to make energy conversion feasible. With our space-missile effort as a spur, programs were soon being set up all over the country.

Out of these programs have sprung some 25 different TE generators. Basically, all consist of a heat source and structure of thermocouples—a thermopile. Thermopiles are constructed so opposite ends of thermocouples are simultaneously heated and cooled. The power depends on the difference in temperature between the two ends. The greater the difference, the greater the power.

The highest efficiency of most thermocouples is about 8 per cent. This is satisfactory for space, but not for domestic use in most cases. In domestic applications where such efficiency may prove adequate, manufacturing costs have been too high to allow commercial production. A small generator—capable of delivering 5 kw, about 6½ hp, might have more than 500 thermocouples. At current rates, cost of producing a TE power generator in volume would be over $1000 per kw, compared to $50 to $150 per kw for conventional power generators. And in the case of larger units, the heavy weight per kilowatt is also against the TE unit.

Despite these current limitations, thermoelectric devices are moving ahead at a rapid rate. Let's take a look at some of the applications.

An early industrial application was — fittingly enough—in the gas industry. In late January, Northern Illinois Gas Co. announced that it had had a 10-watt TE generator installed in a cathodic protection application for the past seven months. Made by Minnesota Mining & Manufacturing Co., the device had "done a perfect job," according to NI-Gas which is now testing a 100-watt unit specially built by Westinghouse Electric Corp. (See story on Page 66.)

The most recent (at this writing) development in thermoelectricity is the mid-February announcement by Minnesota Mining & Manufacturing that a group of leading gas utilities were joining it in "a cooperative program for the design of pre-production prototypes of a thermoelectric furnace generator." At the close of the 18-month program, each of the 11 participating utilities will receive an operating furnace system in which a TE generator supplies the power for the blower or pump motors. At the same time, a prototype will be submitted to AGA for testing and approval. A 3M official emphasized that the company is only trying to take advantage of its 12 years experience with thermoelectric materials, that it has no intention of making furnace systems, only some of the components. Furnace manufacturers will be invited to use the prototypes and accompanying engineering data to incorporate TE generators in their own production models.

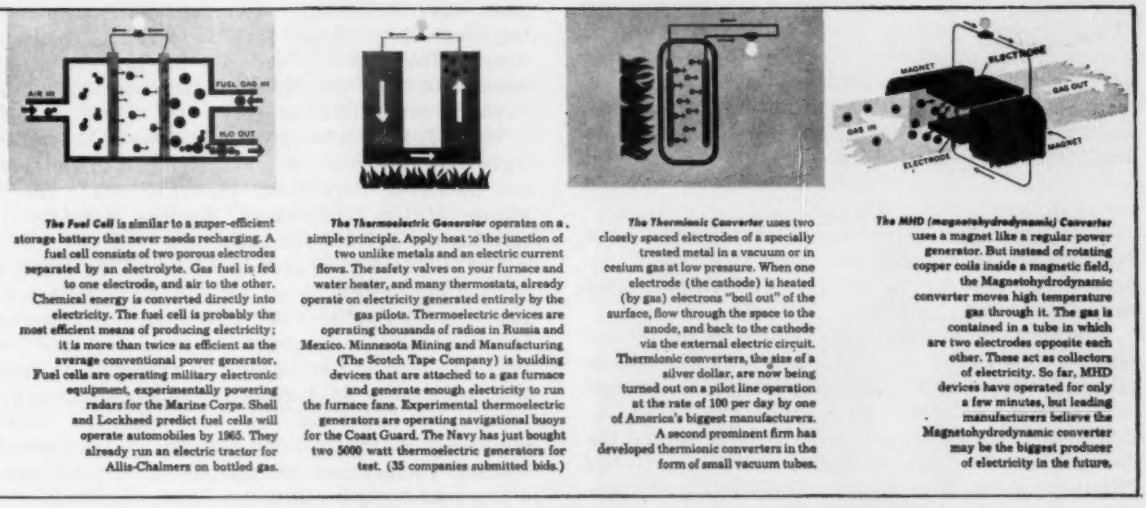
The company, which demonstrated a wall heater with a TE generator at the AGA convention last October, cited four distinct advantages for the new unit: (1) no operating cost, since the unit only "borrows" heat; (2) gradual start-ups, eliminating sudden drafts and noises; (3) heating service unaffected by power failures; (4) virtually nonexistent maintenance costs, since the TE generator has no moving parts.

Utilities participating in the program include: Brooklyn Union Gas Co., Columbia Gas System, Consolidated Natural Gas System, Laclede Gas Co., Lone Star Gas Co., Michigan Consolidated Gas Co., Minneapolis Gas Co., Northern Illinois Gas, Peoples Gas, Light & Coke Co., and Southern California and Southern Counties Gas companies.

Prior thermoelectric developments for home heating include: a late 1959 announcement by Lone Star Gas that it had developed a TE-powered infra-red ceiling heater for bathrooms, and—previous to that —the AGA announcement that it had conducted successful TE tests for small furnace fans. Lone Star's bathroom heater used 24 lead telluride thermocouples, each costing $4.50. However, by the time the heater was announced, the thermocouple price had dropped to $2 and it is believed that cost might eventually be lowered to 50 cents.

As already mentioned, many of the TE devices were developed for space and missile use. Others have been developed for the armed services, but for land or sea duty.

In the latter category are two devices by General Instrument Corp. One, announced late last year, was designed for the Coast Guard as a power source for lights in land markers and off-shore buoys. A 20-in. high cylinder with two small boxes attached, it weighs 20 lb, will operate unattended steadily for one year on $15 worth of propane. The other General Instrument thermoelectric device is a 10-lb, 5-watt unit capable of running unattended for a year on 50 gal. (about $10 worth) of propane. It is intended as "an ultra-reliable, unmanned source of power for



The *Fuel Cell* is similar to a super-efficient storage battery that never needs recharging. A fuel cell consists of two porous electrodes separated by an electrolyte. Gas fuel is fed to one electrode, and air to the other. Chemical energy is converted directly into electricity. The fuel cell is probably the most efficient means of producing electricity; it is more than twice as efficient as the average conventional power generator. Fuel cells are operating military electronic equipment, experimentally powering radars for the Marine Corps. Shell and Lockheed predict fuel cells will operate automobiles by 1965. They already run an electric tractor for Allis-Chalmers on bottled gas.

The *Thermoelectric Generator* operates on a simple principle. Apply heat to the junction of two unlike metals and an electric current flows. The safety valves on your furnace and water heater, and many thermostats, already operate on electricity generated entirely by the gas pilots. Thermoelectric devices are operating thousands of radios in Russia and Mexico. Minnesota Mining and Manufacturing (The Scotch Tape Company) is building devices that are attached to a gas furnace and generate enough electricity to run the furnace fans. Experimental thermoelectric generators are operating navigational buoys for the Coast Guard. The Navy has just bought two 5000 watt thermoelectric generators for test. (35 companies submitted bids.)

The *Thermionic Converter* uses two closely spaced electrodes of a specially treated metal in a vacuum or in cesium gas at low pressure. When one electrode (the cathode) is heated (by gas) electrons "boil out" of the surface, flow through the space to the anode, and back to the cathode via the external electric circuit. Thermionic converters, the size of a silver dollar, are now being turned out on a pilot line operation at the rate of 100 per day by one of America's biggest manufacturers. A second prominent firm has developed thermionic converters in the form of small vacuum tubes.

The *MHD (magnetohydrodynamic) Converter* uses a magnet like a regular power generator. But instead of rotating copper coils inside a magnetic field, the Magnetohydrodynamic converter moves high temperature gas through it. The gas is contained in a tube in which are two electrodes opposite each other. These act as collectors of electricity. So far, MHD devices have operated for only a few minutes, but leading manufacturers believe the Magnetohydrodynamic converter may be the biggest producer of electricity in the future.

There are four devices that turn gas directly into electricity without using moving parts. These drawings and explanations appear in a current series of ads—by SoCal and SoCounties —telling the public that "the power source which cooks your egg will soon light your home."

radio communications, sea and air navigation aids, and industrial and scientific instrumentation in remote areas." Measuring 12 in. in each direction, it resembles a paddle-wheel with a thick hub.

Two other devices in the same category have been built by Westinghouse. One is TAP-100 (terrestrial auxiliary power, 100 watts), a 40-lb, medicine-ball-sized, propane-burning TE generator that produces enough power to light an ordinary room. Built for the Air Force, its main application is powering electronic installations in remote areas.

The second Westinghouse unit was built jointly with the Carrier Corp. and is probably the most spectacular TE generator yet devised. It is spectacular in two respects. First, it develops 5000 watts. Second, its overall efficiency has jumped from 4.9 per cent to 9.3 per cent and is expected to reach 12 per cent—thus far, the highest for a TE device—by the middle of this year. It uses either natural gas or kerosene. Two units were purchased by the Navy after 35 companies submitted bids.

A report released in mid-February by the Naval Research Laboratory describes current TE research projects of the Army, Navy, and Coast Guard. "Higher efficiencies continue to be achieved," concludes the report, "both in materials for cooling and for power generation, with no indication of reaching a point of diminishing return."

Many scientists think the future of TE is bright. Two basic problems are improving thermoelectric materials and improving fabrication techniques.

The big problem in materials development is that a material with a high electrical conductivity is inclined to have a high thermal conductivity. Thus, unwanted heat flows through the TE material along with electricity. This heat should be converted to electricity. Needed are materials which go against the rule, being good conductors of electricity and poor conductors of heat, while having high thermoelectric power. In looking for these materials, scientists are pursuing different research paths. Some are looking for new materials, others are trying liquid semiconductors, and still others are altering—by adding impurities—the crystal structure of old, established TE materials like lead telluride. A smaller material problem, preventing disintegration at high temperatures, is also being solved.

And, also being studied are numerous problems that affect manufacturing costs. Foremost among these is the development of labor-saving fabrication techniques which provide low resistance contacts at thermocouple junctions while being stable enough to withstand breakage when heated or jarred.

THERMIONIC GENERATORS

Thermionic generators may be the second energy conversion device to go into widespread practical usage. One manufacturer is currently turning out 100 such units per day.

This device uses two closely spaced electrodes of a specially treated material in a vacuum or in cesium gas at low pressure. When one electrode—the cathode—is heated by gas, electrons boil out of its surface and flow through the space to the anode. As with thermoelectric devices, the working fluid is a stream of electrons. The difference is that in the thermionic device, electrons flow through a vacuum or a gas, rather than in a solid as in thermoelectric devices. Thus, the thermionic device somewhat resembles a vacuum tube.

As might be expected, the big electrical and electronic firms have made the bulk of the progress to date.

The manufacturer turning out 100 units per day, for example, is General Electric. And the same company has also turned out the largest thermionic de-

vice to date. That 100-per-day unit is about the size of a silver dollar, weighs 3 oz, and delivers one watt. However, it costs $300 to $350 and its efficiency is only about 4.5 per cent. Still, it serves its purpose, fitting into space satellites, getting its low heat requirement from the sun, and actuating devices which send data back to earth. That largest thermionic unit built so far puts out 100 watts. It, too, is intended for space use.

(The latter unit, however, will be dwarfed by a 300-kilowatt thermionic generator now being designed for the Atomic Energy Commission. This device will weigh 1000 lb.)

Another familiar electronics name in on the ground floor of thermionics is RCA. A typical thermionic device developed by RCA for defense use is contained in a hollow tube about 12 in. long and 1¾ in. in diameter. It fits in the expansion cone or around the flame tube of a large solid-propellant missile, like Minuteman. The heat of the missile's exhaust generates electricity to power steering instruments. Best results to date for this design are a top efficiency of 10 per cent at an operating temperature of 2919 deg. F. However, RCA scientists recently announced that they have developed a unit which produces 14 per cent efficiency and at only 2012 deg. F, or within the range of natural gas.

The third member of electrical manufacturing's "big three," Westinghouse, is also in the picture. Westinghouse has designed a combination thermionic and thermoelectric generator for nuclear fuel. The thermionic generator would be in the center, taking advantage of the greatest heat. The thermoelectric generator would surround it, working on the lower temperatures.

Research is, of course, going on at other companies. Included in this group are General Atomic, Thiokol, Thompson Ramo Wooldridge, and others.

As with thermoelectric devices, the future of the thermionic generator depends on solving certain material problems. Foremost of these is developing a cathode material that will be stable enough to last 20,000 to 25,000 hr, instead of the 20 to 100 hr of present materials.

FUEL CELLS

The fuel cell could beat the thermionic generator to widespread usage. Sometimes described as "a super-efficient storage battery that never needs recharging," it consists of two porous electrodes separated by an electrolyte. Gas is fed to one electrode, air or oxygen to the other. The gas is absorbed by a catalyst on the anode electrode. It is activated and reacts in the electrolyte, releasing a stream of electrons to an external circuit. Meanwhile, oxygen is absorbed at the cathode, reacting with an electron from the external circuit and with the electrolyte, reforming the ion used up at the anode.

This direct conversion via an electrochemical reaction means an inherently high theoretical efficiency and that's the prime reason for all the interest in fuel cells. Actually, the fuel cell is probably the most efficient known means of producing electricity. Many fuels have theoretical conversion efficiencies ranging from 85 to 95 per cent. In practice, somewhat lower values are obtained, but the fuel cell is still more than twice as efficient as the average conventional power generator.

While fuel cells could be just around the corner, right now they are still developmental. And there are plenty of developers, including AGA, the Institute of Gas Technology, Battelle Memorial Institute, and private concerns.

The IGT labs have certainly been at the forefront of fuel cell development. An IGT man presented a paper on fuel cells at the 1959 AGA operating section conference and about the time you read this, four IGT men will be making an extensive presentation before the AGA research and utilization conference in Cleveland. On that day, the world's knowledge of the fuel cell will go up considerably.

Battelle announced late last year that it had begun a five-year "major research effort" to advance fuel cell technology. The program is designed to complement existing government, industrial, and academic studies. It is being underwritten by some 25 major American and European industrial organizations including: chemical, petroleum, transportation, mechanical equipment, public utilities, and engine and automotive manufacturing companies. In making the announcement, project director Dr. John McCallum said: "Before the fuel cell's full potential can be realized, there will have to be a number of inventions, innovations and breakthroughs."

Among private firms whose fuel cell development work has come to attention are Pratt & Whitney Aircraft and Allis-Chalmers Manufacturing Co. Pratt & Whitney announced a year ago that it and Leesona Corp. were entering "an enlarged joint research and development program covering the entire field of the fuel cell."

Perhaps the most eye-opening development in this field has been the Allis-Chalmers fuel cell tractor unveiled in October 1959. Using a mixture of gases, "largely propane," 1008 fuel cells fed electricity to a 20-hp electric motor. The 5270-lb vehicle developed "at least 3000 lb of drawbar pull, enough to pull a multiple-bottom plow." It's already in the Smithsonian Institution's collection of historic farm machinery, but Allis-Chalmers continues the fuel cell experimentation it began in 1955. Among the projects underway are: "more advanced and sophisticated" types of fuel cells, further applications of fuel cell power, and a life test in which a bank of cells has operated for nearly 4000 hr. Latest announcement from A-C is that it has a fuel cell demonstration kit for use in the nation's schools.

What problems remain to be solved? Many, Dr. Elliott of the IGT labs readily admits. One problem he believes his labs have now licked is sealing the individual cell to keep the electrolyte inside. This is important because a number of cells are always piled together. The problem now receiving the most attention is selecting the best possible electrolyte material. Among the alternatives are solid electrolytes, which may help lower the current operating temperature in the neighborhood of 1500 deg. F. Costs must be lowered, too, although they aren't

too bad—compared to other energy conversion devices. "With today's technology," says Dr. Elliott, "we can build a 1-kw unit for $300 to $400."

And the future? Dr. Elliott sees an 800-watt fuel cell, measuring just 1 ft in each direction, supplying a household's entire electrical needs. The unit would operate at a full potential 24 hr a day, storing up energy in a number of batteries, perhaps common automotive batteries. The efficiency of such a unit would be between 75 and 80 per cent. Dr. Elliott believes that within the next decade fuel cells will probably be used in many of the smaller applications and after that, more extensively in larger power units.

MAGNETOHYDRODYNAMIC CONVERTER

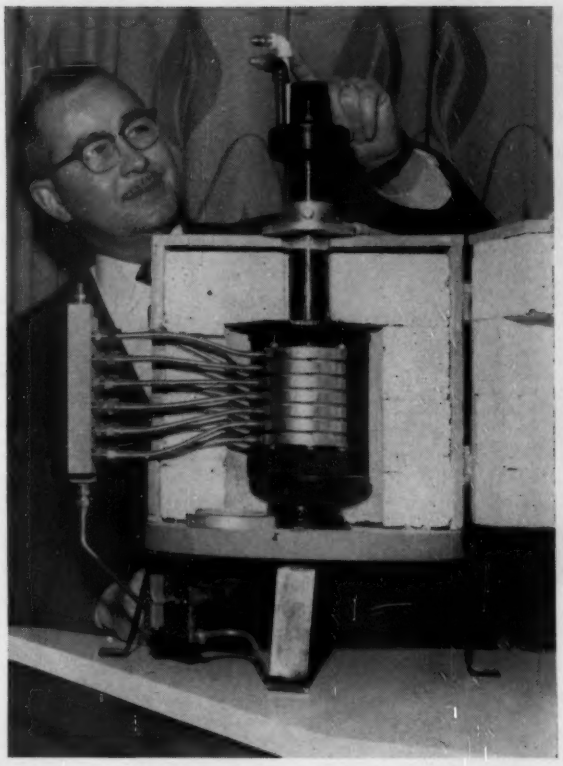
While at this point probably the least advanced of the four energy conversion devices, the magnetohydrodynamic converter (MHD, for short) is in at least two ways the most exciting of the lot. For one thing, MHD has the highest operating temperatures of the group—as high as 5000 deg. F—and therefore some of the biggest problems—one MHD device could only be run for three seconds, for fear it would melt. The second reason for interest in MHD is the potential ability of producing the equivalent of thousands of horsepower per cubic yard of equipment.

The MHD converter resembles a d-c generator, but has no moving parts. It uses a magnet, but instead of rotating copper coils within the magnetic field, high temperature gas is moved through it. So hot that it partially ionizes and therefore becomes electrically conductive, this gas passes through a tube which has an electrode on each side. The electrodes collect the electricity. The hot gas, called plasma, can be either combustion products of the fuel itself or an inert gas—such as helium or argon. In either case, there is a so-called seeding agent, such as cesium or potassium, which ionizes at a much lower temperature. Only a small fraction of gas molecules need be ionized for the gas to become conductive. The seeding agent supplies a sufficient amount.

MHD is efficient only in large megawatt sizes, hence its primary interest would be to electric utilities. Its increased efficiency over conventional power plants lies in the high operating temperatures, not the unusual way of converting heat directly into electricity. Since there is still usable heat in gas that emerges from an MHD generator, this gas can be fed into steam power plants. Thus, additional electricity can be produced. The combination of MHD and steam might result in 50 to 70 per cent efficiency, compared to about 40 per cent for the best steam plants today.

Since MHD produces direct current, an inverter is usually needed to convert it into alternating current. Such an inverter would constitute 20 to 30 per cent of the cost of a large power plant, so great savings could be effected if direct current could be used.

While MHD is still very much in the laboratory, progress is growing and at least four experimental



IGT's Dr. Martin Elliott shows a model of one of the fuel cells currently operating in the IGT labs.

MHD converters have been announced in recent months.

AVCO reports the most powerful unit. It produced 10 kw for 10 seconds. The heat was supplied by an electric arc and perhaps less than one per cent of the applied energy was converted. Sponsored by 10 eastern utilities, AVCO research continues, trying to boost this low efficiency.

Westinghouse has built two units. One of them has the best MHD endurance record to date, four minutes. It's a fuel-oil using device that produces 2.5 kw. A smaller model burns hydrogen and oxygen.

General Electric built one of the earliest MHD converters, a 1-kw device that produced power for about three seconds.

MHD presents several problems, the biggest of which is finding materials that will confine hot plasma without disintegrating. Research is also aimed at making the gas more conductive and improving heat exchangers and inverters.

CONCLUSION

From the preceding, it is not at all hard to conclude that the thermoelectric generator, the thermionic converter, and the fuel cell can play a big part in the future of the natural gas industry.

Within a few years, it should be feasible for the industry to be able to fight the inefficient all-electric home with the highly efficient, truly all-gas home. ■

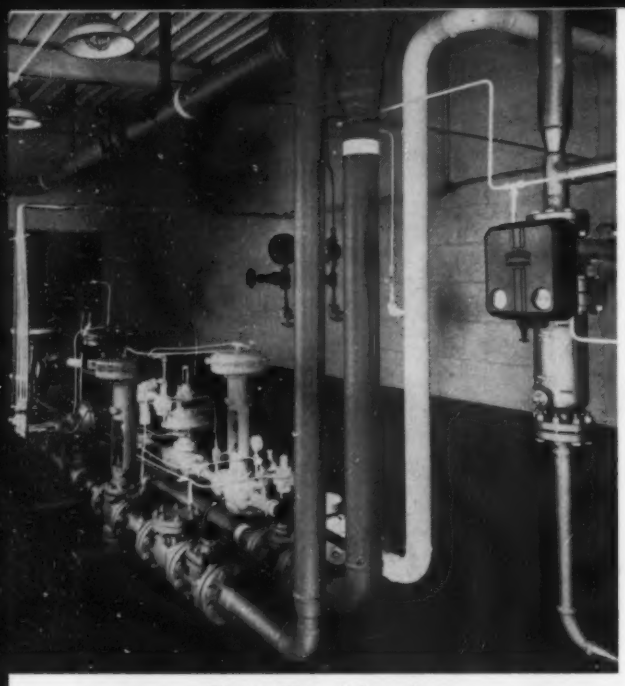


Fig. 1. The mixing plant.

Worcester's automatic peak shaving plant

By JOHN L. TURNAN

BECAUSE of the ever increasing prices of natural gas and the changes in the peak shaving gas supply from our pipeline suppliers, peak shaving and pressure control becomes ever so important. A fully automatic propane plant could answer both these problems.

The plant we have installed at our Hudson take station is the first fully automatic, remotely controlled, unmanned, high pressure propane-air mixing plant to go into operation. It is controlled by telemetering from a point about 16 miles away, and is remotely started, operated, and shut down, and can be operated independently of any power failures.

Basically, the mixing plant has two orifice runs, with two pressure regulators for maintaining constant pressures on each run. Instead of two orifice plates, we use two Hancock flow control valves for the required volume of air and propane for the Btu required. These valves have calibrated figures on them which may be used if any change in Btu is required.

This unit is good for 80 Mcf per hour, or approximately 2 million per day, and can be doubled by the installation of one more compressor and tank. This plant cost about $70,000 and the automatic equipment cost about $15,000—or about $35 per thousand capacity.

The advantages of this mixer are:

1. *Practically instantaneous* adjustment to flow rate variations without Btu variation.

2. *Only two basic moving parts* required. These are pressure regulators with which a normally skilled serviceman is familiar.

3. *Shipped as a package,* completely assembled and pre-tested.

4. *Control panel shipped* as a package complete with flow meters, flow controllers, or any equipment dictated by the needs of your particular situation.

5. *By changing one selector switch,* the control panel can be by-passed in case of control failure and the unit continues to operate automatically with only basic elements of the system functioning.

6. *This system can be furnished* for any capacity and any line pressure.

7. *The basic safety device* is a differential pressure switch. As long as differential pressure across preset orifices is within prescribed limits, the Btu of output is constant. This is a *straight line variable,* therefore, no *complicated instrumentation* is required to get *positive* safety control.

8. *Unit can be put on the line* at an assured Btu content within a matter of seconds.

9. *Turndown ratio can be extremely wide.* (One plant now in operation—in Plymouth—has a 250-1 turndown ratio, all fully automatic.)

10. *Easy and economical* to maintain.

11. *No highly skilled* operators required.

12. *This system is as simple* as a low pressure constant rate jet mixer, yet will handle highly variable loads and will produce any desired sendout pressure.

13. *The unit works* on a differential pressure principle, therefore, it is just as accurate at 200-lb sendout pressure as it is at 5-lb sendout pressure.

Fig. 1 shows the unit. *Fig. 2* is a flow diagram.

The compressor chosen was a standard gasoline,

Mr. Turnan is manager of production and transportation at Worcester (Mass.) Gas Light Co.

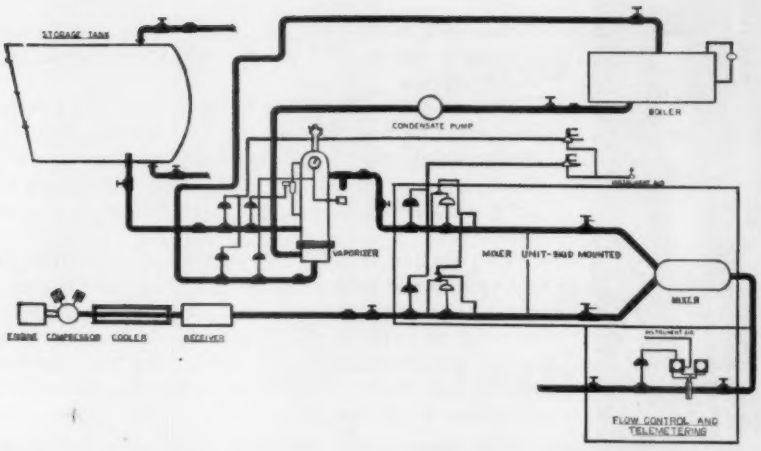


Fig. 2. Flow diagram.

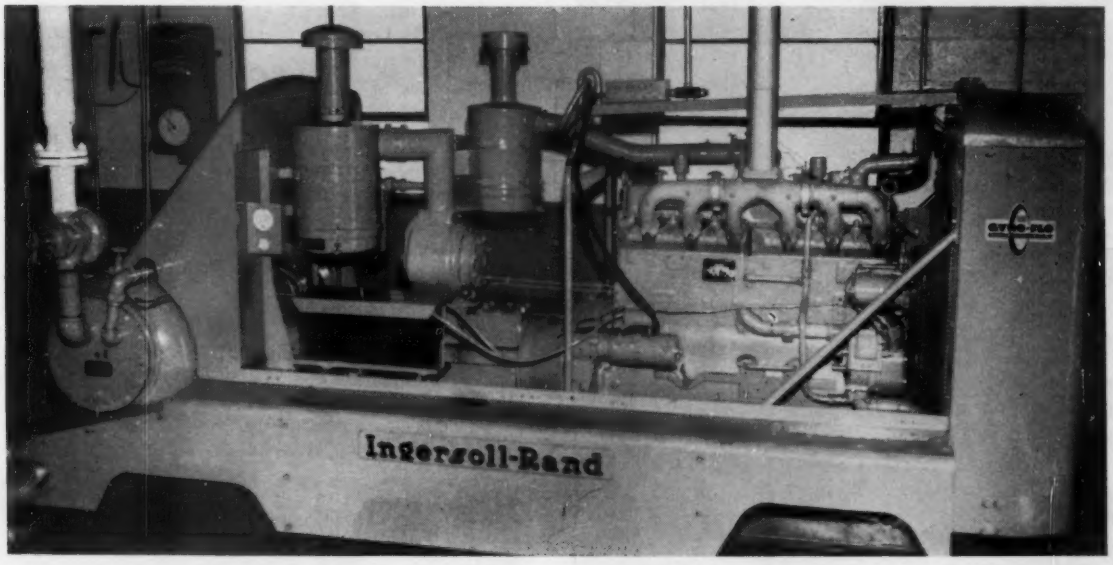
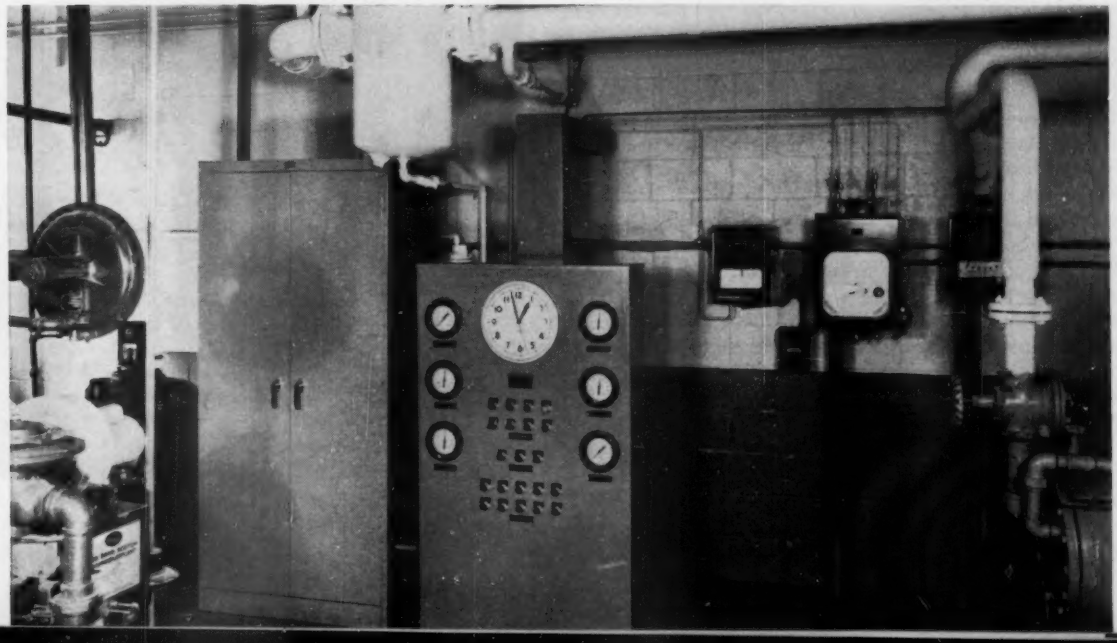


Fig. 3. Skid-mounted compressor.

Fig. 4. Automatic control board.



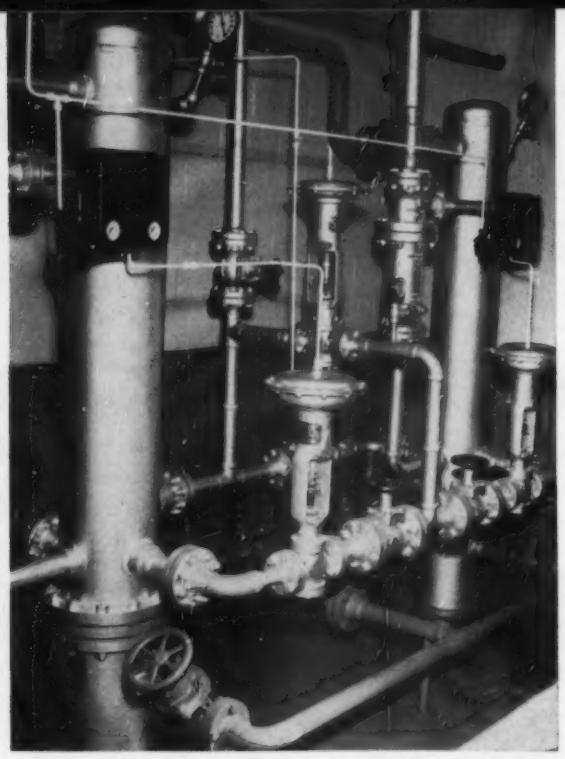


Fig. 5. Steam vaporizer with liquid level controllers.

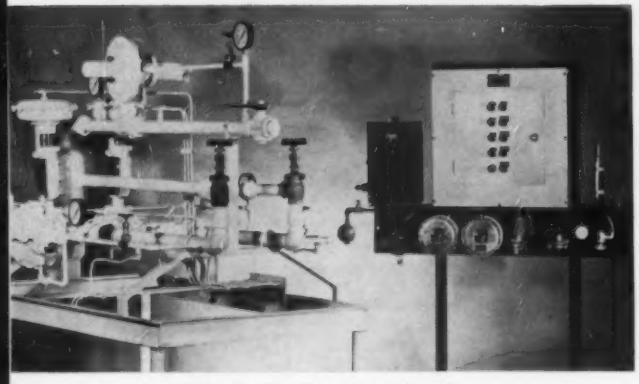


Fig. 6. Small packaged unit.

contractor's compressor, skid mounted. This already was equipped with all of the necessary controls, including its own air tank. We operate it with natural gas or propane vapor. This also supplies air for instrumentation. *Fig. 3* shows this unit. This also has the advantage of requiring no special foundation or belt drives. It can be skidded right in on the floor and just piped to the airline from its own tank.

Fig. 4 shows the automatic control board at the station, flow controller and pressure recorder. The cabinet on the left houses the tone equipment for control signals from the Framingham dispatching office. Once the Btu is set, a Ranarex is used for control by gravity. If anything should go wrong with the mixture, it would automatically shut down the plant. This is shown in *Fig. 3* with the compressor.

Fig. 5 shows the steam vaporizers with liquid level controllers. A duplicate of the panel board is installed in the Framingham office with its tone equipment. All signals are sent over one pair of wires which also transmits signals of station take at the natural gas meter station.

With the flow controller, once the dispatcher starts the plant, he may control the flow by the flow controller which records the flow at his station as well as from the natural gas station. From this he knows exactly what percentage is going into the system at all times.

This station is used for both pressure control on peak hours and peak shaving, as he can start and stop it as he pleases. This type of station could be made to come on automatically in case of a pressure drop or any interruption of gas supply. We are considering the use of one of these stations instead of a Hortonsphere at the end of one of our lines.

This type of unit also is being built in a package unit including compressors, vaporizers, etc., as low as 25,000 cfh. This package unit is being considered to delay the laying of 4 miles of 8-in. main to see how the territory develops. *Fig. 6* shows one of the many small units. Any of these plants, if installed, will operate at 100-lb pressure.

In our Milford station we have installed the same size plant operating on low pressure jets. The boilers, vaporizers, flow control, automatic starting and stopping, are exact duplicates of the ones at the Hudson station.

Fig. 7 shows the jets operating at 2.5 psi. These discharge into a surge tank. At the outlet of this tank we have a regulator and flow control to cut to inches of water. This station operates in conjunction with a Cleveland controlled regulator for automatically raising the pressure as the flow increases. ■

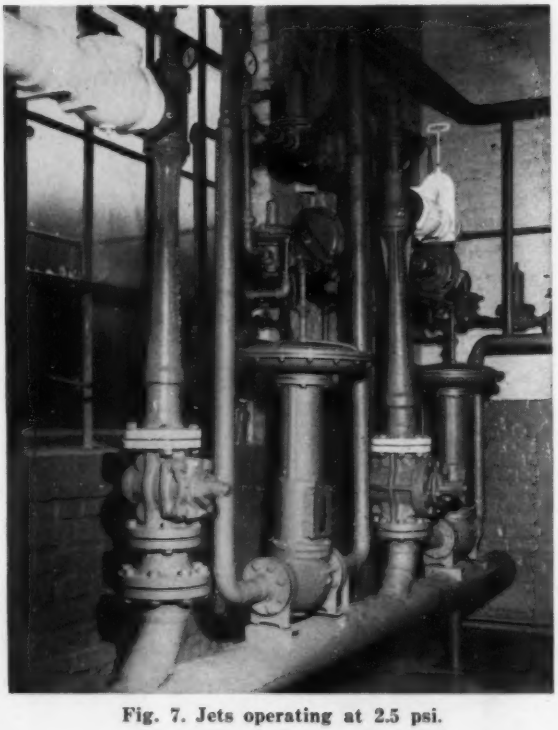
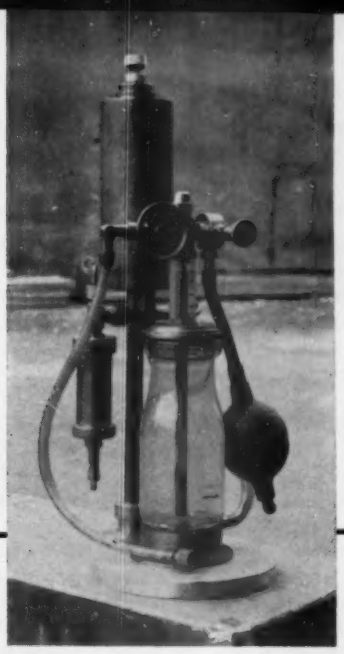


Fig. 7. Jets operating at 2.5 psi.



GAS exclusive

OFG's chief leakage inspector designs

A calibrator for testing gas detectors

By CLIFFORD W. MULLET
Ohio Fuel Gas Co., Mansfield, Ohio

DURING the past few years our company has standardized on a well-known make of hot wire combustible gas detector for use in our leakage inspection program. For some time we were confronted with the problem of devising some method of testing the accuracy of our detection instruments so that we could feel reasonably safe that our leakage inspectors would not overlook leakage areas because their gas detectors were not operating properly. Although a gas detector might be registering on the indicating meter, we could not be sure our instruments were reading accurately.

I tried various methods of testing our instruments to determine their practicability and accuracy.

One method which showed promise was the use of a standard Oronite Odorometer. This is a standard instrument used by the gas industry for smell testing the odor intensity of the gas in distribution lines. This instrument is capable of providing gas-air samples or mixtures of 10 per cent and 20 per cent of the lower explosive limits of natural gas.

For some time these two mixtures were used in testing our gas detectors by aspirating samples of these mixtures, from the top of the Odorometer, through the detector being tested and comparing the detector readings with the two known concentrations obtained from the odorometer.

As these two gas-air mixtures occupied only the lower one-fifth of the scale on our detectors, there was always the uncertainty as to whether the upper four-fifths of the scale was in error or not.

A method was devised in the use of the Odorometer in which an orifice was introduced into the air intake, thus cutting down the supply of air while the gas supply remained undisturbed. By using a gas detector which was known to be accurate, by trial and error, a new set of calibrations was determined for the rotometer on the Odorometer. This rotometer, or flow meter, makes it possible to determine the amount of gas introduced into the air supply of the instrument for mixing samples of known concentrations. These new calibrations enable gas-air mixtures of sufficient concentration to be obtained to enable the entire indicating scale to be tested on our gas detectors.

While this method served its purpose, the unit was very inconvenient to use as it required both gas and electric connections.

Several methods of testing gas detectors were also introduced by different manufacturers of gas detection equipment, but most had the disadvantage of testing only a small portion of the detectors' scale or were rather inconvenient in use.

We then decided to attempt to design a testing device or calibrator which would be convenient as well as accurate to use.

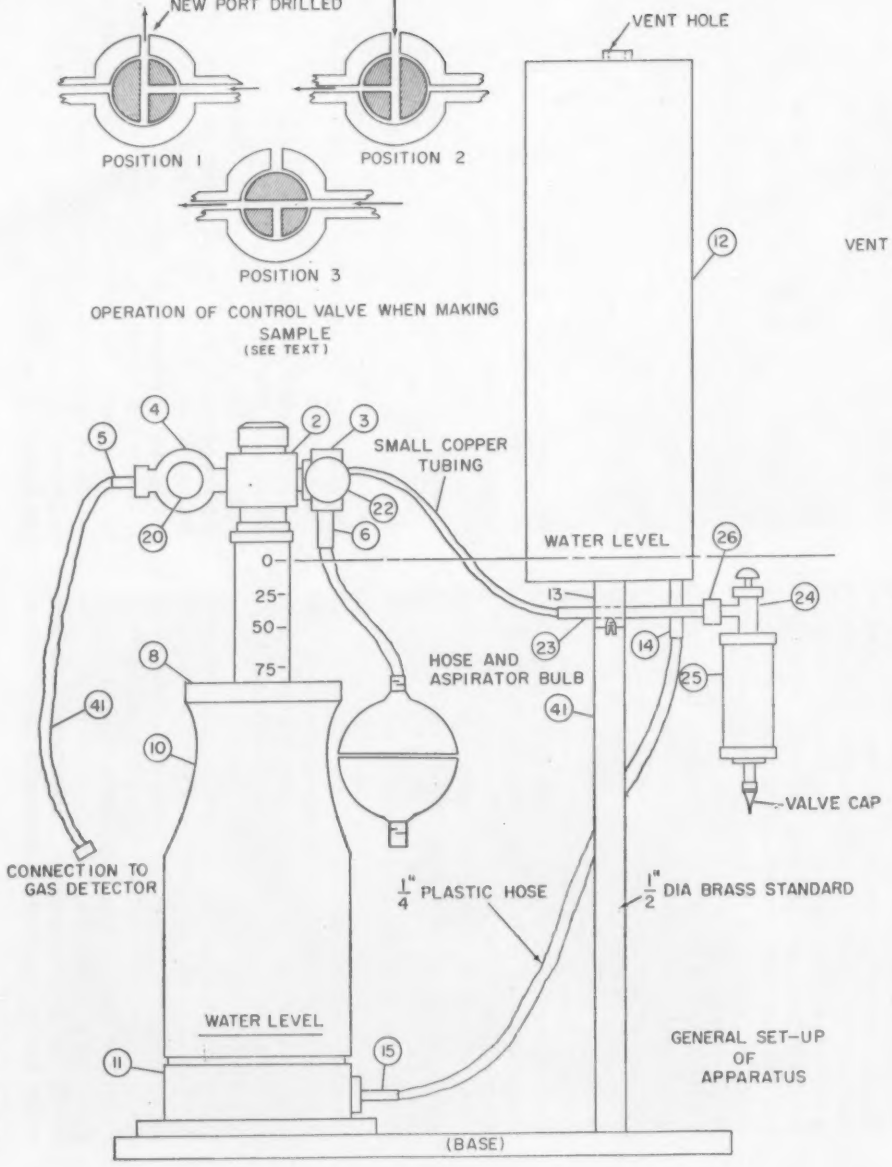
It took about a year and a half—of my spare time—to develop the final design as described here. A two-year test period has proved it to be a practical convenient and accurate means of testing the operation of the gas detection equipment used by our company. It is also very portable as it is entirely self-contained requiring no outside connections in use.

The instrument will provide gas-air samples at 25 per cent, 50 per cent, and 75 per cent of the lower explosive limits of natural gas. Propane was chosen for a testing gas because of its ready availability and low cost.

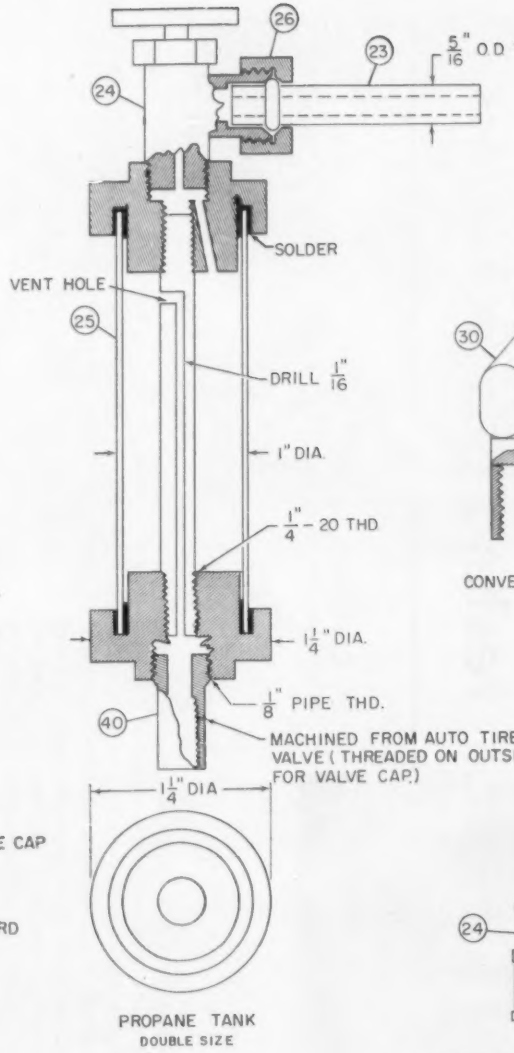
The principal problem in designing an instrument which can prepare identical gas-air samples time after time has been solved in this design by using the time-honored principle of displacing a measured amount of liquid to measure the amount of gas and air needed to prepare a sample.

The unit is essentially a modified form of U-gauge or manometer. (See *drawing.*) The gas-air mixing column serves as one leg and the overflow tank (12) as the opposite leg of the U-gauge. Only one leg of the U-gauge is calibrated.

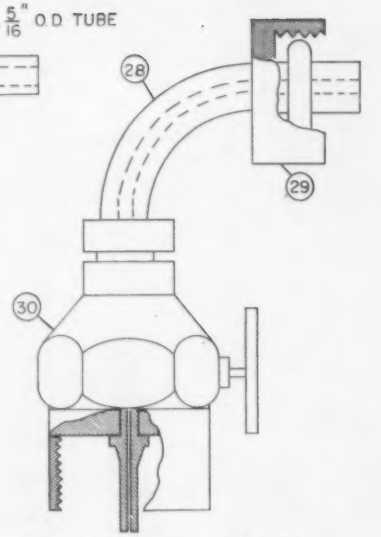
OPERATION OF CONTROL VALVE WHEN MAKING SAMPLE
(SEE TEXT)



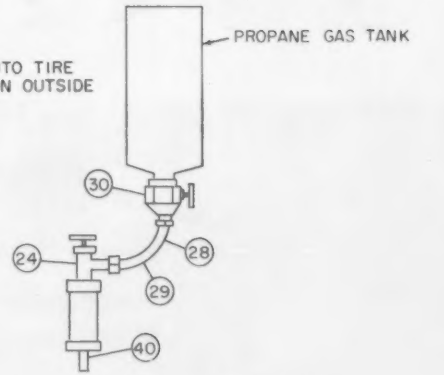
GENERAL SET-UP OF APPARATUS



PROPANE TANK
DOUBLE SIZE



CONVERTED PROPANE GAS TORCH



METHOD OF CHARGING GAS TANK FROM CONVERTED BERNZ-O-MATIC PROPANE GAS TORCH.

Opposite: Drawings of the general setup of the apparatus, operation of the control valve, and the propane tank and torch setup.

Here is a description of the principal parts:

(11)—Base; simple lathe turning, use brass or aluminum.

(10)—Sample holder; ½-pint glass milk bottle. Drill ⅜-in. dia. hole in bottom. Use ⅜-in. brass tube and emery powder for drilling hole.

(8)—Brass lathe turning.

(18)—Gas measuring tube; glass boiler gauge tube; ½-in. ID x ¾-in. OD x 1⅞ in. long.

(2)—Column tee head; brass lathe turning.

(1)—Brass nut; ¼-in. x 20 thread.

(9)—Brass tie rod; thread ends ¼-in. x 20 thread.

(3)—Gas-air mixing body; turn from brass; drill and thread as shown.

(6)—Aspirator bulb connection; this is a standard ⅛-in. pipe thread brass fitting with a standard tire valve core insert; it can also be machined from a long-type auto tube valve stem.

(7)—Valve core; spring is weakened so valve will operate on the air pressure developed by the aspirator bulb used to pump air into the mixing body when preparing a gas-air sample.

(4)—Three-way control valve; valve is made from an ordinary ⅛-in. pipe thread gas cock. A third port is drilled through the body and core of the cock, at a 90-deg angle with the original bore as shown in the drawing. Excess metal is machined from the cock to provide a neater looking unit.

(19)—Core of control valve.

(20)—Control wheel.

(5) (14) (15)—Brass hose connections for ¼-in. plastic hose.

Gas control valve—To make it possible to control the minute amounts of propane needed for preparing the gas-air sample, it was necessary to develop a special needle valve.

The cross section of the valve will make the construction easily understood. Part (16) is a standard ⅛-in. pipe thread x 3/16-in. OD flare-type copper tube connection. The connection is drilled and tapped for 10-32 thread and the tapered end countersunk to provide room for stem packing.

Part (17) is a standard ⅛-in. pipe thread x ¼-in. OD compression-type tube fitting. Drill the pipe thread end ¼-in. diameter as shown in sketch. The adapted hypo-needle is soldered into this hole, thus making a seat for the needle valve. The hypo-needle is the smallest bore needle you can obtain. The square head is turned to ¼-in. diameter and soldered into the hole as mentioned. The stem (21) is threaded 10-32 thread and the end drilled to accommodate the large-size sewing needle which is soldered in place. This needle seats into the inside bore of the hypo-needle, thus making a very precise needle valve. Some fitting will be necessary to get the proper lengths for parts of the needle valve. Part (16) and (17) are then screwed into the proper openings of the mixing body (3).

Mixing body and 3-way control valve are screwed into side openings of the column tee head (2).

Propane tank—This tank is easily constructed from various brass turnings and tubing as shown by the cross section drawing. Part (24) is a standard ⅛-in. pipe thread x 5/16-in. OD compression-type tubing-fitting needle valve. This assembly is self-explanatory.

Overflow tank—Brass tank (12) is easily constructed as shown by cross-section drawing.

General setup of apparatus—Photos and drawing show the general setup of the various components of the device. To insure good operation, the liquid level in tank (12) should always be slightly above the bottom of the tank when the liquid level is at the zero per cent index mark on the gas measuring tube. This is *important* for good operation.

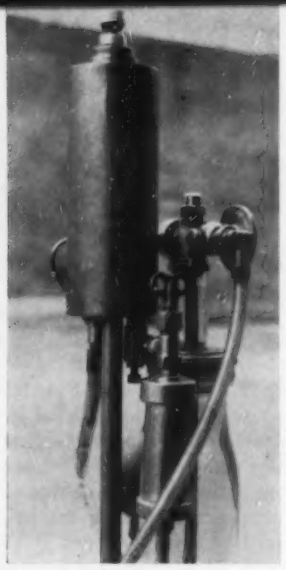
As the cross-section drawing of the general setup shows, the various components are assembled on the ¼-in. brass tie-rod with leather washers at the designated places and the whole unit drawn together with the brass nut (1). Use care not to tighten enough to crush the glass parts.

Operation of the calibrator—Before the apparatus can be calibrated, it is necessary to know how to prepare a sample. The procedure is as follows (refer also to the detail drawing, "Operation of Control Valve" when making samples):

Turn control wheel (20) to Position 1. (This wheel should have some sort of index mark on the rim so the position of valve openings can be easily ascertained.) Purge unit of traces of former samples by pumping rubber hand bulb a few times. After liquid has settled to the zero per cent mark on tube, turn wheel to Position 2. Purge out detector, which has previously been connected to unit by hose connection (41) by aspirating air through the gas detector in the usual way and setting the indicating meter to zero. Open needle valve on propane tank. Open gas control valve wheel (22) and allow gas to enter unit until it has pushed the water column down in the gas measuring tube (18) to the 25 per cent index mark. Turn gas off with the control wheel (22). If there are no leaks in the unit, and the check valve (7) in the aspirator bulb hose connection (6) is holding tight, the water column will remain steady at the division mark it was adjusted to. Next pump air into unit with aspirator bulb, pushing the water through the hole in the bottom of the sample holder (10), through hose and into the overflow tank (12) until the liquid level in the sample holder (10) rests at the water level index mark near the bottom as shown in the drawing. A 25 per cent of LEL of natural gas is now prepared.

Turn control wheel (20) to Position No. 3. Water flowing from tank (12) back into the unit will force the sample out through the 3-way valve, hose, and into the gas detector. No aspirating of the sample through the detector is needed as the pressure of the sample itself will force itself through the detector. After observing reading on the gas detector meter, any error between the meter reading and the known 25 per cent LEL sample can be determined. Control wheel (20) is then turned to Position No. 1 again and the remains of the sample will be discharged to the air via openings shown in the control valve operation drawing. All traces of sample are

Views of the calibrator



purged out of unit by pumping a couple of bulbs of air through the unit, turning control wheel to Position No. 2 again and repeating the same sequence of operation for preparation of the next sample. Gas is then introduced into measuring tube until liquid rests at the 50 per cent index mark. A little practice will make mixing a gas-air sample a very rapid operation.

To calibrate unit—A gas detector, which is known to be accurate and in good working order, is used for calibrating the unit. Since the detector used by our company is graduated from 0 to 100 per cent of the lower explosive limit of natural gas, the unit is calibrated to prepare samples of 25, 50, and 75 per cent of the scale. Since the same type detector is used for calibrating, as will be tested thereafter, it makes no difference what type of gas is used in the unit. For the reasons noted before, propane was chosen as a testing gas.

First, paste a strip of paper on the gas measuring tube for a temporary scale. Make a 0 per cent index approximately ⅜ in. from the top end of the glass tube. A 25 per cent index is placed approximately 11/16 in. from the top end of the tube, a 50 per cent index about 1 in. from the end, and 75 per cent index approximately 1⅜ in. from the top end of the tube. These index marks are approximate but will give a start in calibrating the instrument.

A water line index mark is placed 1 in. above the bottom of the sample holder (10).

Fill the unit with water or some type of non-freezing liquid to the level of the 0 per cent index mark. Use a medicine dropper for bringing the water level exactly to the mark.

Now mix a 25 per cent sample, using the temporary 25 per cent index mark. If the detector reads high when this sample is run through, move your index mark toward the top of the tube (18). Repeat this process until you have a 25 per cent index mark, which when used for mixing a sample will give a 25 per cent reading on the detector. The other 50 per cent and 75 per cent index marks are obtained by using the same method. After the new index marks have been proven correct by repeated tests, they are made permanent by some convenient means. A method which has proven successful consisted in marking the index marks and figures in with india ink and then covered with a strip of scotch tape.

To recharge propane tank—A complete Bernz-O-Matic propane torch is obtained. The burner head is discarded. The brass tube connecting the tank connection and burner head is bent at a 9-deg angle. The 5/16-in. OD compression type fitting on the needle valve (24) is loosened and slipped off the end of the gas tank support tube (23), placed on the end of the bent brass tube (28) and turned up tight. Valves (30 and 24) are opened. The large Bernz-O-Matic tank is inverted as shown in the sketch. The vent (40) contains a tire valve core (the whole unit can be machined from a standard tire valve stem). This valve core is pushed, allowing pressure to vent off the top of the propane in the small tank, down through the vent hole in the ¼-in. diameter brass tie-rod. Hold this valve in until liquid propane appears at the vent (40). The tank is now full. Valves (30 and 24) are closed and the small tank re-installed on tank support tube (23). A tire valve cap is screwed tightly on end of the vent.

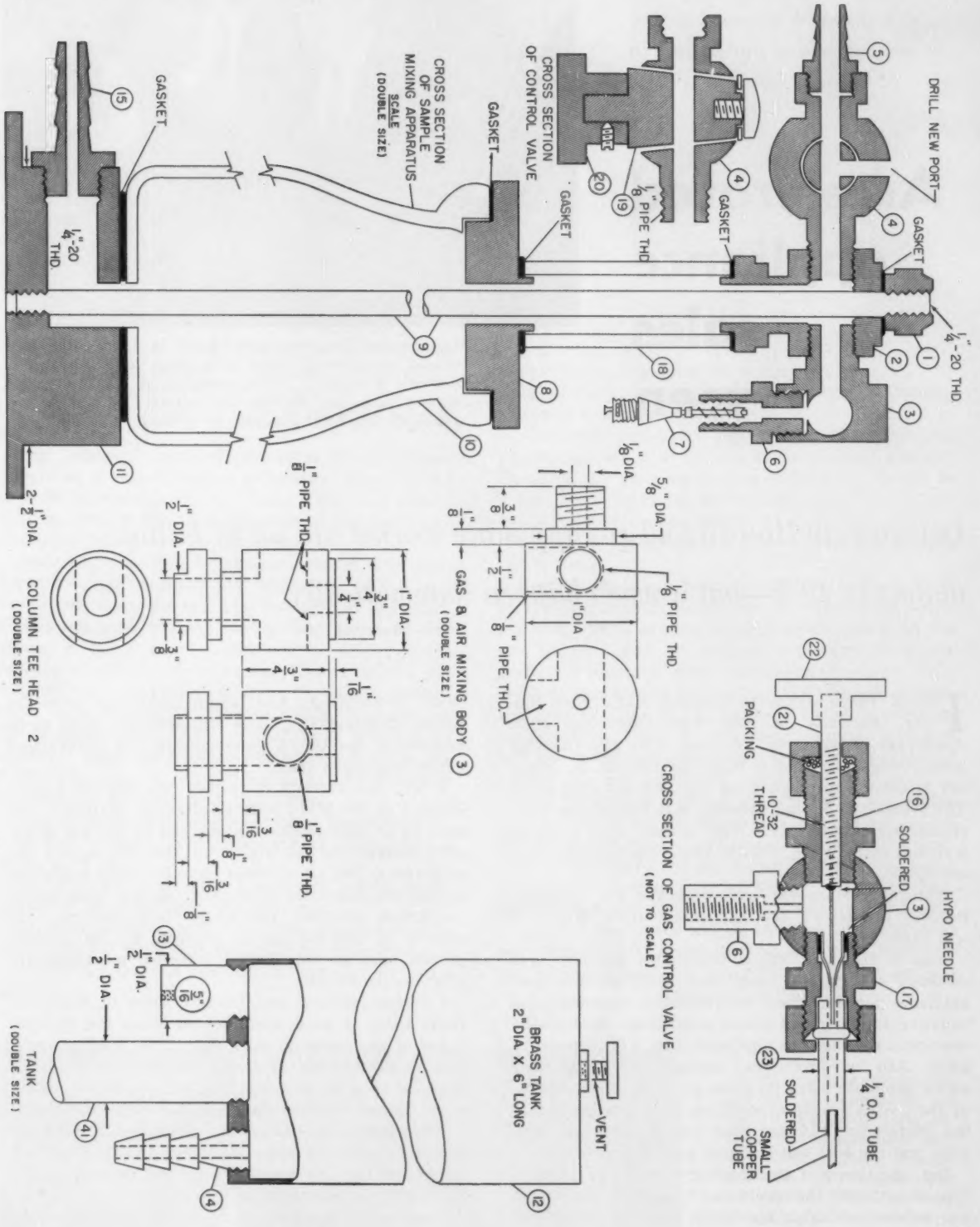
Always keep unit in level position when in use. Leveling screws could be installed in the base if desired for ease of leveling the unit.

If liquid level will not remain steady at any index mark, the check valve (7) is probably leaking. A drop of brake fluid on the rubber seat will remedy this difficulty. Also keep the 3-way control valve lubricated with grease for easy, gas-tight operation.

The aspirator bulb connection (6) as well as the propane tank vent (40) are standard valve fittings which were used in the pump connections of high pressure bags used for gas main stoppers. They are also available as a standard brass fitting.

Although this instrument was developed for testing a specific gas detector, the unit can also be used for testing other detectors by simply calibrating the unit using the same type of detector that will be tested with the finished calibrator. ■

These drawings show the cross section of the sample mixing apparatus; the cross section of the control valve; the gas and air mixing body; the cross section of the gas control body; the column tee head; and the tank.



By J. FRED EBDON • Editor

Gas utility and manufacturer sales teamwork stressed as key to gas appliance marketing in the Sixties

Accelerated appliance sales seen

Lei-bedecked Chet Stackpole (AGA) in Aloha shirt (purchased in Arizona), chats with (from left): Cribben & Sexton's Wendell C. Davis, president of GAMA; Harold Massey, managing director and secretary of GAMA; and James C. Stopford, president of Honolulu Gas Co.

Delegates in Hawaii told gas appliance market can hit $1 billion dollars in 1970—but it won't happen automatically.

FROM Tokyo, Japan to Winfield, Kan.; from Sidney, Australia, to New York City; and from Anchorage, Alaska, to LA—over 150 gas industry people winged or sailed to Honolulu, Hawaii, in February to discuss merchandising gas and gas appliances. The event: the Second Biennial Mid-Pacific Gas Merchandising Conference. The scene: the Princess Kaiulani hotel in the Waikiki area. The outlook: very optimistic.

Naturally, whenever and wherever gas industry matters of import are happening—GAS Magazine was there.

Also in Honolulu was a determined group of gas company sales people, appliance manufacturers, and appliance dealers. Their determination accepted little negative thinking and gloom predicting. Rather, the consensus revealed gas appliance sales will increase in 1961. And we didn't hear anyone crying too hard about appliance sales progress in 1960. As a matter of fact, AGA's ultra-exhortative Chet Stackpole told the conference: "If last year was a bad year, then 1960 was the best bad business year experienced."

But, the theme of the meeting was not based on a type of optimism that could lead to neglect. Rather, it was pointed out again and again that for selling gas appliances in the Sixties, a faster, smarter, harder "sell" is required. And, again borrowing from the words of Stackpole, if new frontiers are going to be reached in the 1960's, salesmanship, not government effort, will reach them.

I will not attempt to report the words of each speaker at the Mid-Pacific Conference. Rather I will pass on to GAS readers an analysis of the gas appliance market for the Sixties as revealed during the conference. Not all of these thoughts were expressed during the scheduled addresses. As any experienced convention attender will know, conversations with experts in the lobbies, at lunches, during cocktail parties, and at other more informal moments, are often as productive.

I probed, studied and learned while in Honolulu. Here, then, is what was gleaned from the fruitful talent of gas company sales executives, leading appliance manufacturers, sales and other executives, home builders, association executives, and appliance dealers at the Second Biennial Gas Merchandising Conference.

The associations'—AGA and GAMA—statistics for potential appliance sales are valid goals. They are obtainable through teamwork by gas companies and gas appliance manufacturers.

One speaker went so far as to say that gas appliance sales could gross $1 billion in 1970 if the team

concentrated on positive factors and approach. These factors are satellite to the idea that so long as consumers can make a choice, gas appliances must be superior to achieve this sales goal.

Exploring that concept, the question was asked: are modern gas appliances available right now going to be in the miracle kitchens of 1969? Will today's gas appliances be modern even in 1965? Most delegates seem to feel that if the industry answers yes, the fantastic market of the Sixties will not be realized for the gas industry.

On the other hand, the meeting brought out the intensive effort and wide scope of gas appliance research. This work is being carried out in numerous manufacturers' development sections, in some 25 independent research institutes (during 1961), and in association laboratories. It was further voiced that there is no such thing as a minor development in gas appliances and that if any salesman accepts that fact, then he does not limit his market as appliance manufacturers are making product advances almost daily.

Thus, new appliances now in the laboratories will —in the opinion of most industry leaders available at the Honolulu conference—meet the needs of the more demanding, more sophisticated, more aware consuming public the gas industry is going to have to sell in the Sixties.

This "sharper" group of consumers for the Sixties is made up of the children of technology. They are the 18-to-20 year-old group of today. They will own a great number of the 15 million new homes that were estimated will be built in the 1960's.

Sharpest competition for the gas industry with these "children of technology" and in the 15 million new homes will be in the fields of heating and air conditioning. It goes without saying that increased emphasis in these fields should not be made at the expense of efforts for other appliances if the gas industry's over-all objectives are to be realized. Rather, these fields will find increasingly difficult paths for future exploitation. And, in fact, most students of appliance sales see tougher competition for the gas industry as a whole. Out in Honolulu, they seemed to welcome the prospect with confidence.

As mentioned, this Mid-Pacific group was optimistic. They knew the gas industry has strong points. Strong points such as:

(1) Good public acceptance now that can be modulated into an overwhelming preference.

(2) Gas industry unity which has demonstrated to the marketing world that gas appliance manufacturers and their dealers, and gas utilities, can and will work together.

General Manager W. W. Pettingell, Australian Gas Light Co., not too blushingly receives Hawaii's traditional greeting from Evelyn Pinho, Honolulu Gas Co.

(3) Continuing belief in technical research.

(4) Know-how in promotion, advertising, salesmanship and consumer education.

A warning was issued that in spite of these strong points, gas is in a vulnerable competitive position. Those on top are always more vulnerable. It will be a big job to maintain our present statistical advantages and at the same time build some new ones.

Here is how the group in Hawaii felt this big job can be done.

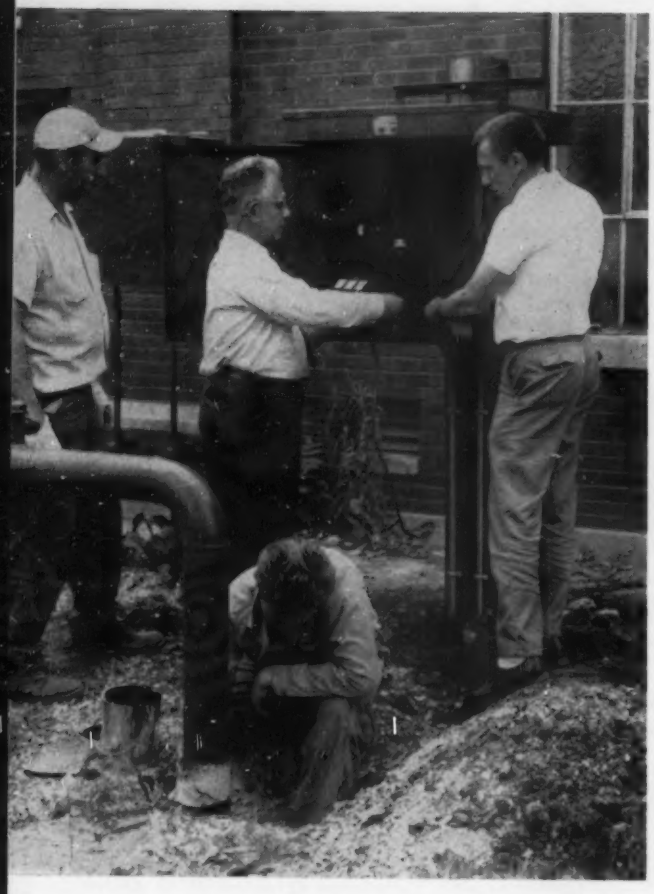
Perhaps the most important factor is market research—for market knowledge is essential to sound planning. It is imperative that all segments in the gas industry and its appliances picture study the needs and wants of their customers.

While speakers made much of the younger generation coming along in the 1960's, I found in informal conversations, that a segmented market approach will also reveal that older people are an often neglected market for gas appliances. Certainly this group is seldom featured in national advertising in any media. Yet, they often are the very people who can best afford the top-of-the-line gas appliance. Further, they have often worked hard and are searching for labor saving and comfort devices that will permit more free time, lighter work periods, and greater pleasure and health.

Another idea in the market research area developed out along Waikiki beach involved builders' impact on gas appliance sales. It was pointed out that perhaps

Continued on page 72

At the luncheon session we see, in the accustomed order, J. Edmund Kern, director of manufacturer services, PCGA; Rudy Munzer, president of Petrolane Gas and LPGA; E. E. Black, Honolulu builder-contractor; and AGA's Chet Stackpole.



NI-Gas engineer Paver places 10-watt thermoelectric generator in housing for field testing in cathodic protection. Through seven months, the device has "done a perfect job."

Thermoelectric generator tested for cathodic protection

NORTHERN Illinois Gas Co. has found results most surprising in its field tests of a 10-watt thermoelectric generator in a cathodic protection application.

Elmer Paver, engineer for NI-Gas, reports the device, custom made for NI-Gas by Minnesota Mining & Manufacturing Co., has done "a perfect job" in its seven months of use in combating corrosion.

Similar field testing now is being done by NI-Gas on a 100-watt unit specially built by Westinghouse Electric Corp.

The 10-watt unit is capable of producing 6 amps of direct current. When installed in place of a rectifier, the device was putting out 3.3 v and 2.9 amps, using 1.1 cu ft of gas per hour. Now the current required of it to offset earth potential is about 2 amp, using less than 2 cu ft of gas per hour.

Paver said operating cost of the thermoelectric generator would be about $3 per year (at the company's cost of natural gas), compared to about $5.90 per year for electric service to energize a rectifier.

While initial cost of the thermoelectric generator was much higher than that of a rectifier ($250-$450, depending upon amperage), NI-Gas engineers believe the price could be competitive if the devices would be mass-produced.

The thermoelectric generator is believed to be durable although NI-Gas has not had sufficient time to determine this.

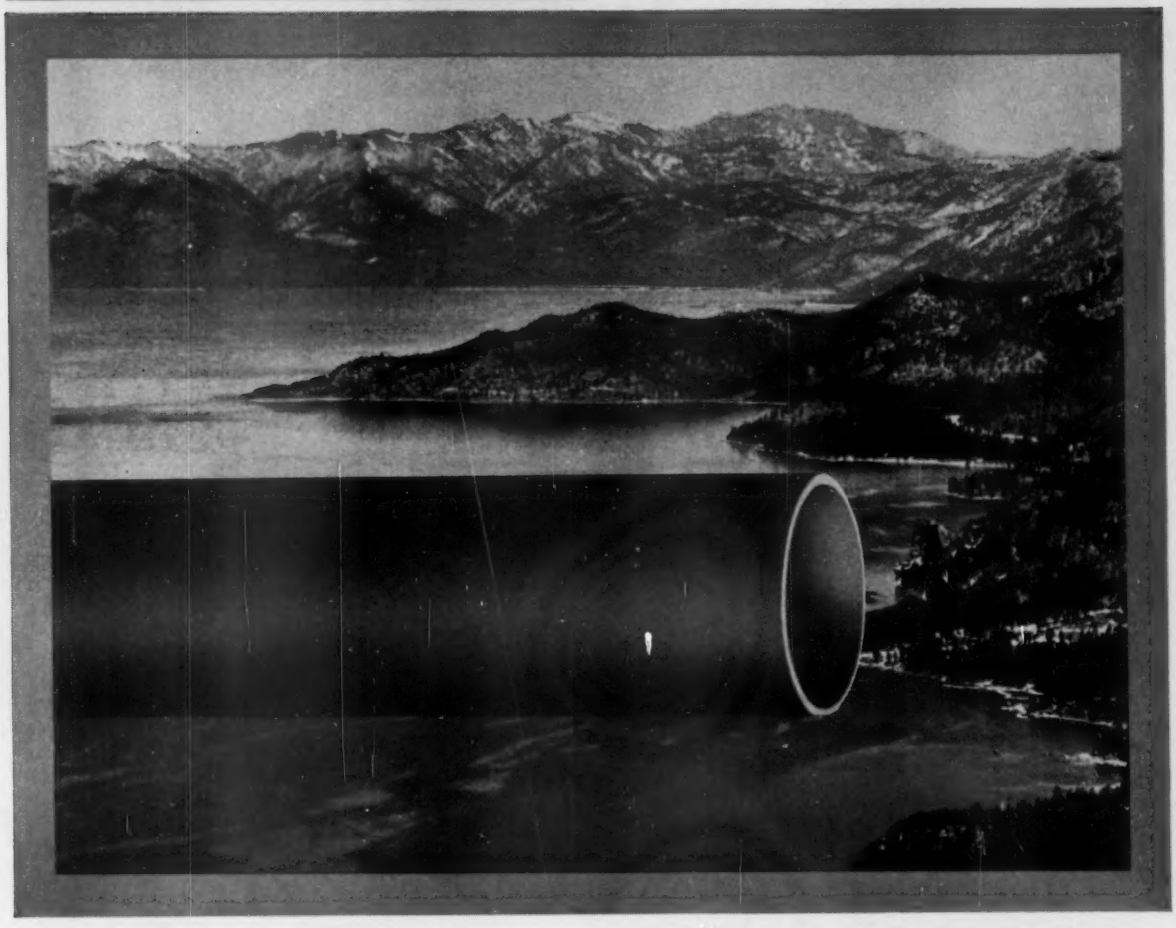
NI-Gas now uses about 100 rectifiers in its cathodic protection program, running an annual electric service bill of about $10,000.

The amount of main a thermoelectric generator can protect cathodically depends, of course, upon the amount of ground current of the area. For instance, a total of 5 amp is needed on NI-Gas' 140-mile, 22-in.-diameter pipeline built in 1959 from near Dubuque, Iowa, to Des Plaines, Ill. NI-Gas' one 10-watt thermoelectric generator could provide this amperage.

A thermoelectric generator operates best on a low resistance circuit, Paver said. It does not work well on very high resistance circuits.

A great advantage it has, Paver reported, is that it can be short-circuited without hurting it. ■

Naugatuck KRALASTIC
THE ORIGINAL ABS RESIN



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Air-Maze Consumer Gas Line Filters have more usable filter area. They effectively eliminate foreign matter – keep pilots, meters, valves and burners in top operating condition. Heating plants, hot water tanks, appliances give trouble-free service, greater customer satisfaction.

Simple construction minimizes parts, cuts leakage points. Dryseal threads prevent leakage on in-and-out connections, eliminate need for pipe sealant. Air-Maze filters can be removed without "breaking" the line. Element easily cleaned with water and household detergent.

Air-Maze Consumer Gas Line Filters withstand pressure up to 125 psi., are available in ¾" and 1" sizes to accommodate nearly every standard gas line in average home or industrial application.

Large filters and filter-separators also available for distribution gas lines.

FREE! Write for Bulletin No. 772 for additional information.

AIR-MAZE DIVISION
CLEVELAND 28, OHIO

ROCKWELL-STANDARD CORPORATION

C. R. Montgomery
Mich Con

Karl Shaver
Columbia

Charles Ward
Northern

Steve Battisto
T. D. WmSon

Joe J. King
Tenneco

GAS · PEOPLE

CHARLES R. MONTGOMERY named assistant controller, Michigan Consolidated Gas Co., Detroit.

KARL SHAVER from assistant secretary to secretary, Columbia Gas System Inc., New York. He succeeds MILTON C. BALDRIDGE, who retired recently.

CHARLES H. WARD joined Northern Natural Gas Co., Omaha, as director of the engineering design department. Ward formerly was with Williams Brothers Co., where he served as project engineer on pipeline design and construction in this country, the Middle East, and South America.

STEVE BATTISTO, JR., from chief applications engineer to assistant sales manager, T. D. Williamson, Inc., Tulsa. Battisto joined the company in 1957 as research and development engineer.

E. M. FOX named manager of the pipeline division of Mountain Fuel Supply Co., Salt Lake City. He succeeds H. M. MCCAMISH, who has joined Bechtel Corp., San Francisco.

JOE J. KING former senior vice president of Tennessee Gas Transmission Co., has been elected president of TGT's new petrochemical company, Tenneco Chemical Co. F. L. PADGITT, formerly director of project development at TGT, was named Tenneco Chemical vice president.

FRANK T. HOUSE from sales promotion manager to sales services manager for Bucyrus-Erie Co., South Milwaukee, Wis.

JAMES V. KING from general engineer to vice president and manager; BAILEY V. COWART named director; WALTER URODA named assistant treasurer; and W. DYER MOORE, JR., named corporate secretary and attorney, all of Western Gas Service Co., El Paso.

WILLIAM E. VANNAH from chief editor of *Control Engineering* to associate for advanced engineering of the Foxboro (Mass.) Co. Vannah will assist *Control Engineering* as a consulting editor.

Continued on page 90

While torque-converter drive is of *primary benefit in front-end loader operation*, it also gives you the extra power and traction you need for getting your backhoe in and out of muddy conditions like this.

Other important benefits you get as standard equipment with the CASE W-3

- Choice of Case-built 52 hp gasoline or Diesel engine
- *Bigger drive tires* — 14.9 x 24 6-ply
- 10-ply front tires
- 7000-lb capacity front axle
- *Full power steering*
- *Shuttle transmission*
- Backhoe digs 14 ft deep. Swings 180° with exclusive foot control
- 2500-lb lift capacity front end loader with 6000-lb breakout force. 15 cu ft to 1 cu yd bucket
- Self-leveling bucket
- *Wide choice of interchangeable attachments* including: dozer, grade-blade, pallet-fork, crane-hook, choice of four loader buckets and eight backhoe buckets

Why your next backhoe-loader should have both torque converter and direct drive

Many users of wheel-type backhoe-loaders make the mistake of buying the *lowest priced* rig available — only to discover that it *doesn't* have enough power or traction to handle many of the jobs expected of it. For this reason, you will be money ahead by choosing a higher-output machine, like the Case W-3, that combines the power-boosting benefits of a torque converter, with the speed and economy of direct drive. Here's why!

Travels and works where others can't

Since a torque-converter-equipped tractor provides an *infinite* number of speed ratios — down to 0 mph without stalling — you get *a lot more traction, with minimum wheel slippage.* Result: With the Case W-3, you can load faster, backfill, climb slippery grades, travel and work through hub-deep mud that would stall ordinary wheel rigs.

Double push-pull power—without clutching or shifting

The diesel or gas-powered Case W-3, with torque converter, gives you *twice* as much push-pull power as the same size conventional rig. In addition, torque output is matched to the load instantly—AUTOMATICALLY—*without clutching, shifting, or stalling.* This enables you to load-out bigger payloads much faster with the front-end loader... a tremendous time-saver in backfilling, and clean-up operations... an extra money-maker in truck-loading.

Full hydraulic priority . . . longer life

The converter keeps engine and hydraulic pump running at full effective rpm, without "lugging down". You *always* have full hydraulic power for fast break-out with the loader bucket. The torque converter also gives you longer tractor life since all components are protected against operating shocks by a "cushion" of hydraulic oil.

Drives job-to-job at 19.3 mph

With the Case W-3 loader, or combination backhoe-loader, you get all these proven benefits of torque-converter drive — *plus* a handy lock-out lever that lets you *switch to direct drive "on-the-go"* — for 19.3 mph road travel.

Nets you more profit per dollar of investment

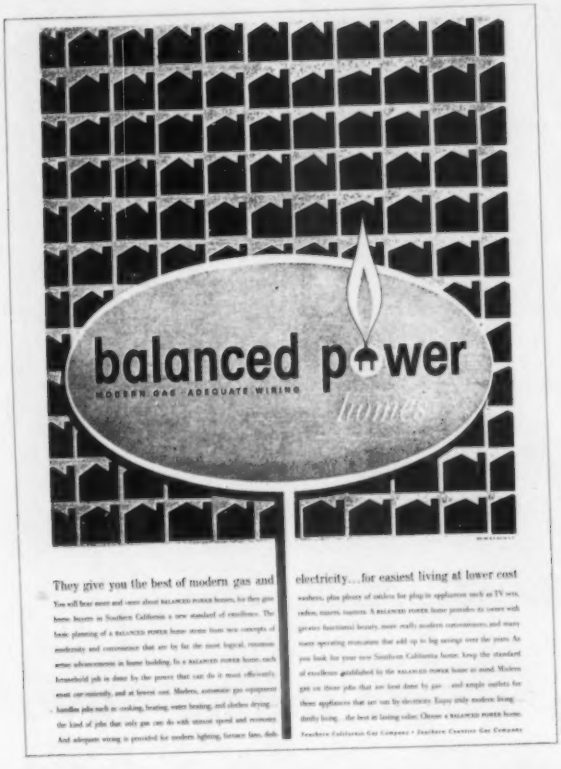
While the Case W-3 costs a few dollars a month more than so-called "economy" diggers, its extra productivity and go-anywhere ability, enable you to handle a *wider range of backhoe-loader jobs at higher net profit.* See your Case Industrial Dealer for convincing proof, or write J. I. Case Co., Dept. D1391, Racine, Wis.

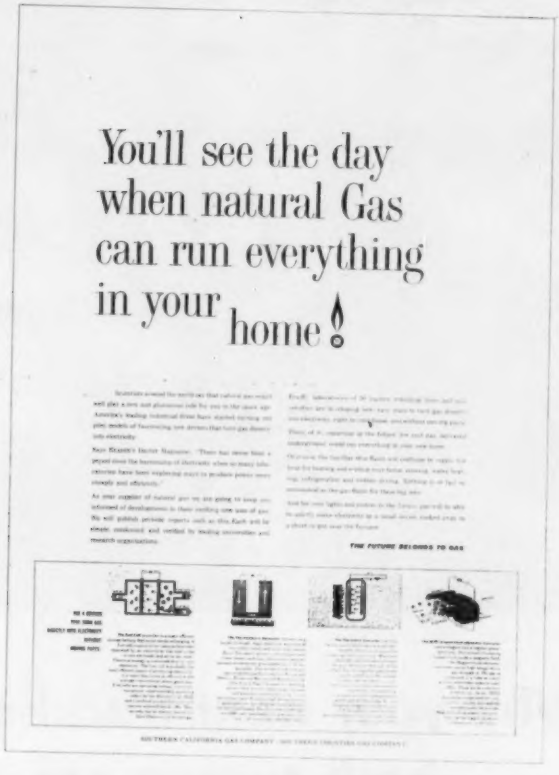
CASE®

J. I. CASE CO., RACINE, WIS.

C-BL-535

ONLY THE CASE W-3 GIVES YOU BOTH . . . SEE AND COMPARE IT TODAY!


balanced power
MODERN GAS · ADEQUATE WIRING
homes
They give you the best of modern gas and
electricity...for easiest living at lower cost



Gas companies orbit with unique ad campaigns

THE utility community was rocked, and a few gas industry eyebrows lifted, as Southern California and Southern Counties Gas companies blasted off with their sensational "Balanced Power" advertising program (see cuts). Not content with that, the two southern California gas utilities also started Reddy Kilowatters scratching their heads with a companion "The Future Belongs to Gas" program.

Balanced Power is a new concept of home energy utilization that recognized a need for both modern gas and electricity in today's living. In a Balanced Power home, each household job will be done by the power source that can do it most efficiently, most conveniently, and at the lowest cost—according to the subject gas companies.

Under this concept, automatic gas equipment will handle cooking, spaceheating, water heating, and clothes drying. Electricity, in turn, is given the tasks of providing visibility lighting (except decorative and other lighting applications where gas can do it prettier and better), and power for plug-in appliances, radios and TV's, garbage disposers, dishwashers, gas-furnace and ventilation fans, etc. Just what disposition is made of refrigeration seems to be cloudy at the moment.

The southern California companies feel so strongly that Balanced Power is a sensible, forward approach to energy needs of modern homes that they are adopting it in all of their operations.

In a coordinated advertising program, "The Future Belongs to Gas," the companies introduced their customers to the just over-the-hill days when direct gas-to-electricity conversion devices might take over production of that power need remaining in the home under the concept of Balanced Power.

The companies pointed out that great progress has been made in converting natural gas into electricity. This foretells the possibility that the home of the future will have just one power source—natural gas. Four major methods of direct conversion of natural gas to electricity without moving parts, cheaply and efficiently were outlined in the highly interesting—and immediate-impact type — advertising.

Advertising copy has carefully avoided setting any date or time factor for the development of the current gas-to-electricity devices into routine household equipment.

New valuable tool for Gas Dispatching – the ISI 609 Information and Computer System

609

Affecting decisions efficiently within your supply contract limits, ISI's 609 accepts data directly from telemetry or other sources and displays information directly to the dispatcher. Also provides alarms and automatic control adjustments for remote, unmanned stations. Allows operator to take care of critical human decisions, while the versatile 609 handles routine assignments in continuous, reliable operation.

Practical information for profitable control

With over 130 data systems now operating in utilities and process plants, Information Systems, Inc. offers eleven years of experience in all phases of industrial data gathering, information display and computer information systems. An exceptionally broad, completely integrated service is backed by proven hardware designed for reliable, economical control systems. ISI Information Systems guarantee practical information and exceptional versatility.

YOUR COMPANY undoubtedly will install a control system. Will it supply useful, meaningful information immediately? Will it improve plant efficiency and product quality with economic feasibility? Will it furnish closed loop, fully automated control with economy whenever you take the final step? *Your executives should evaluate ISI before you buy. Please write for capability and case history data, or contact your nearest ISI office.*

YOUR BEST INVESTMENT IN POWER AND PROCESS CONTROL • INFORMATION HANDLING • INDUSTRIAL AUTOMATION • NATURAL GAS DISPATCHING

ISI

INFORMATION SYSTEMS, INC.

SYSTEMS DIVISION

10131 NATIONAL BOULEVARD, LOS ANGELES 34, CALIFORNIA

Regional Offices in New York City • Chicago • Houston • Los Angeles

Accelerated appliance sales. Cont. from p. 65

20 per cent of all appliances sold are absorbed into the builder market. While much attention in manufacturers' and utilities' builder programs is given to the volume builder, the small or custom builder is deserving of increased attention.

An estimate was presented that small or custom builders account for about 50 per cent of new homes. Thus, if 15 million homes are built in the Sixties, some 7.5 million of these will be constructed by the small or custom class of builder. In this market, the gas utility is vital. For, the utility meets such builders on the local level. Gas utilities are, in turn, known by the builder and trusted. This is where gas appliance manufacturer and gas utility teamwork reaps spectacularly. The right selling effort puts the builder on the team too.

The same utility-builder-manufacturer team is applicable to volume builder sales of gas appliances. In this prime market, too often the process is turned over to the shipping department after volume appliance sales are made.

A successful volume builder told the merchandising conference that all a gas appliance manufacturer really has to sell to this type of builder is service. While name brands help; and cooperation by gas utilities in promotion, advertising, and demonstration help; customer satisfaction and word of mouth "advertising" sell more homes and gas appliances than consumer advertising. He suggested that salesmen of gas appliances keep in relative constant touch with large-project superintendents to actively service volume builders. Too, follow-up is important after families move into new homes and start using "sold" gas appliances. He recommended that gas company and appliance manufacturer's salesmen actually visit customers in homes to follow-up on appliance sales. Such efforts permanently sell volume builders and home owners on gas appliances.

Creativity in appliance design and engineering is another factor in the big gas selling job for the Sixties. Laboratory research and product improvement were submitted as joint efforts, i.e., the manufacturers must create and gas utilities should support the move to improvement through all phases. For, venture always needs support. Some delegates told me they felt gas companies must guide appliance development.

Among the results of current creativity in gas appliance development, the advent of the gas dishwasher was singled out for special mention. And the bold promise for further improvement in gas cooling and the almost-here thermoelectric-powered, forced-air gas-fired central heating units were highlighted. There are many other fields of gas appliance and utilization research that bear watching.

Gas-energized fuel cells that will one day generate all the electric power for dwellings were a point of

Soft as Moonlight . . .

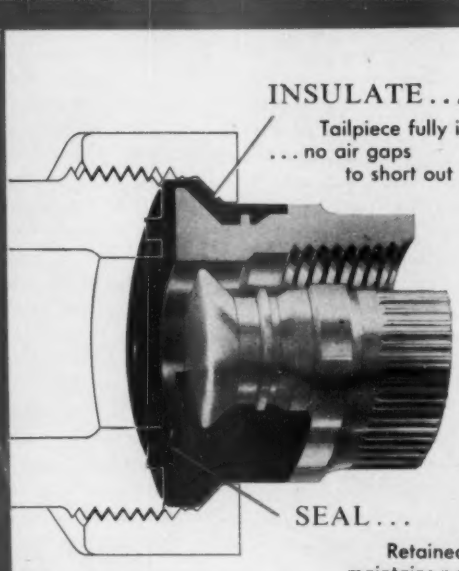
The mellow glow of Gaslites adds delightful charm and interest to any outdoor setting. For information on the golden-crested Embassy or other distinctive Gaslites by Arkla, write

Gaslites by ARKLA

ARKLA • GASLITE DIVISION
SHANNON BUILDING • LITTLE ROCK, ARK.

now! 2 new LubOseal® stops

...with exclusive **MUELLER®** *insulating union outlet*



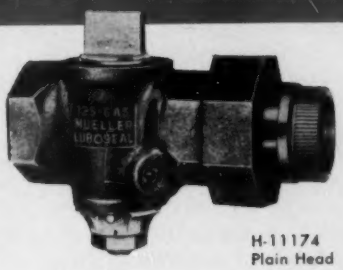
INSULATE...

Tailpiece fully insulated
... no air gaps
to short out

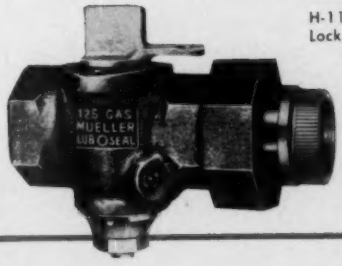
SEAL...

Retained O-ring
maintains positive seal
even with minimum nut torque.

This new Insulating Union will not leak ... is foolproof to install ... Time, weather conditions, pipeline movement will not create leaks ... No loose gaskets to lose during assembly.



H-11174
Plain Head



H-11179
Lock Wing

SPECIFICATIONS

Iron body, bronze key
Straight way, solid head
Tamperproof

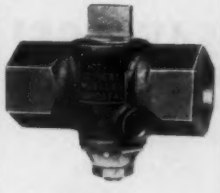
Inlet: Inside I.P. Thread
Outlet: Insulating Union
Finish: Black
(Tailpiece cadmium-plated)

Working pressure: 125 p.s.i.
Working temperature range: —20° F. to 150° F.
Sizes: ¾", 1", 1¼"

A full line of 125 pound gas meter stops

H-11170
Plain Head
Sizes: ¾", 1", 1¼", 1½", 2", 2½"

H-11175
Lock Wing
Sizes: ¾", 1", 1¼", 1½", 2", 2½"



H-11173
Plain Head
Recessed Ends
Sizes: ¾", 1", 1¼", 1½", 2"

H-11178
Lock Wing
Recessed Ends
Sizes: ¾", 1", 1¼", 1½", 2"

H-11199
Relubricating Tool
Handy tool for regreasing all LubOseal Stops to maintain original turning ease. Convenient H-853 grease sticks just fit tool—no waste.

NO-BLO®

Other LubOseal Stops available for working pressures to 500 p.s.i. Write for full information and specifications.

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Factories at: Decatur, Chattanooga, Los Angeles
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intense out-of-meeting discussion. Many delegates felt that in fuel-cell equipped homes of the future, modern, automatic gas equipment will handle jobs that gas can do with the most flexibility, speed and economy—cooking, heating, water heating, clothes drying, yard or patio decoration and lighting, etc.—with gas-generated electricity from the fuel cell being supplied for general lighting, furnace blowers, TV sets, radios, mixers, hi-fi equipment, etc. Other devices to convert natural gas energy directly into electricity were also discussed with some glee.

This meeting lifted many off the mainland confines of the United States and revealed markets for gas appliances throughout the free world. We learned, for example, that Tokyo Gas Co. has 1.85 million gas customers in the city from which it takes its name. There is market on the several islands of our fiftieth state. Natural gas is on the verge of breaking out in Alaska. In fact, from the example given us by the Pacific islands and Pacific-rim countries, there was a conclusion that the gas appliance industry can seek and obtain additional market throughout the world wherever free-enterprise systems exist.

The Mid-Pacific Gas Merchandising Conference is a cooperative project of the Pacific Coast Gas Association; The Honolulu Gas Co. Ltd.; and the Gas Appliance Society of Hawaii. This year, Director of Manufacturer Services, J. Edmund Kern, Los Angeles, was on hand for Pacific Coast Gas Association. The Gas Appliance Society of Hawaii was represented by its current president Michael J. O'Hara; and Honolulu Gas Co. by its president, James C. Stopford, who presided, and a number of participants.

A distinguished covey of association leaders attended. Wendell C. Davis, president of both Gas Appliance Manufacturers Association and Cribben & Sexton, addressed the convention. American Gas Association's president was unfortunately prevented from planned attendance. But AGA was much in evidence through the presence and words of Managing Director Chet Stackpole.

R. J. Munzer brought the colors of Liquefied Petroleum Gas Association to the meeting. He is president of that association and Petrolane Gas Service Inc., Long Beach, Calif. Munzer was quickly warmed when Hawaii's first Governor, William F. Quinn, applauded the important part LPG is playing in the development of the outer islands of Hawaii lying off varying distances from Oahu.

Gas Appliance Manufacturers Association was additionally represented by Managing Director Harold Massey. His address, "With Strong Bold Steps," was particularly well received and, we thought, was the most forceful of the conference.

Plans are already underway for the Third Biennial Gas Merchandising Conference to be held in 1963. We would suggest that those in the merchandising side of the gas business interested in a hard-working, sales-workshop, type conference, in very pleasing surroundings, place this meeting on their 1963 itineraries. ■

A BELL RINGER FOR SAVINGS!

BELL CRANK ASSEMBLY
includes hex aluminum slide, bell crank of rust-resistant cold-rolled steel.

We swapped a bell crank assembly for the famous Reynolds toggle assembly in our Series 8010 House Service Regulator . . . And created the NR*B* 8010 as a companion to the toggle type, the NR*T*. For real economy, the new NRB 8010 rings the bell! . . . You can't beat the *performance* of either model of the reliable Reynolds 8010!

We'll be most happy to send you complete information, take your order, and ship you a carton or a carload!

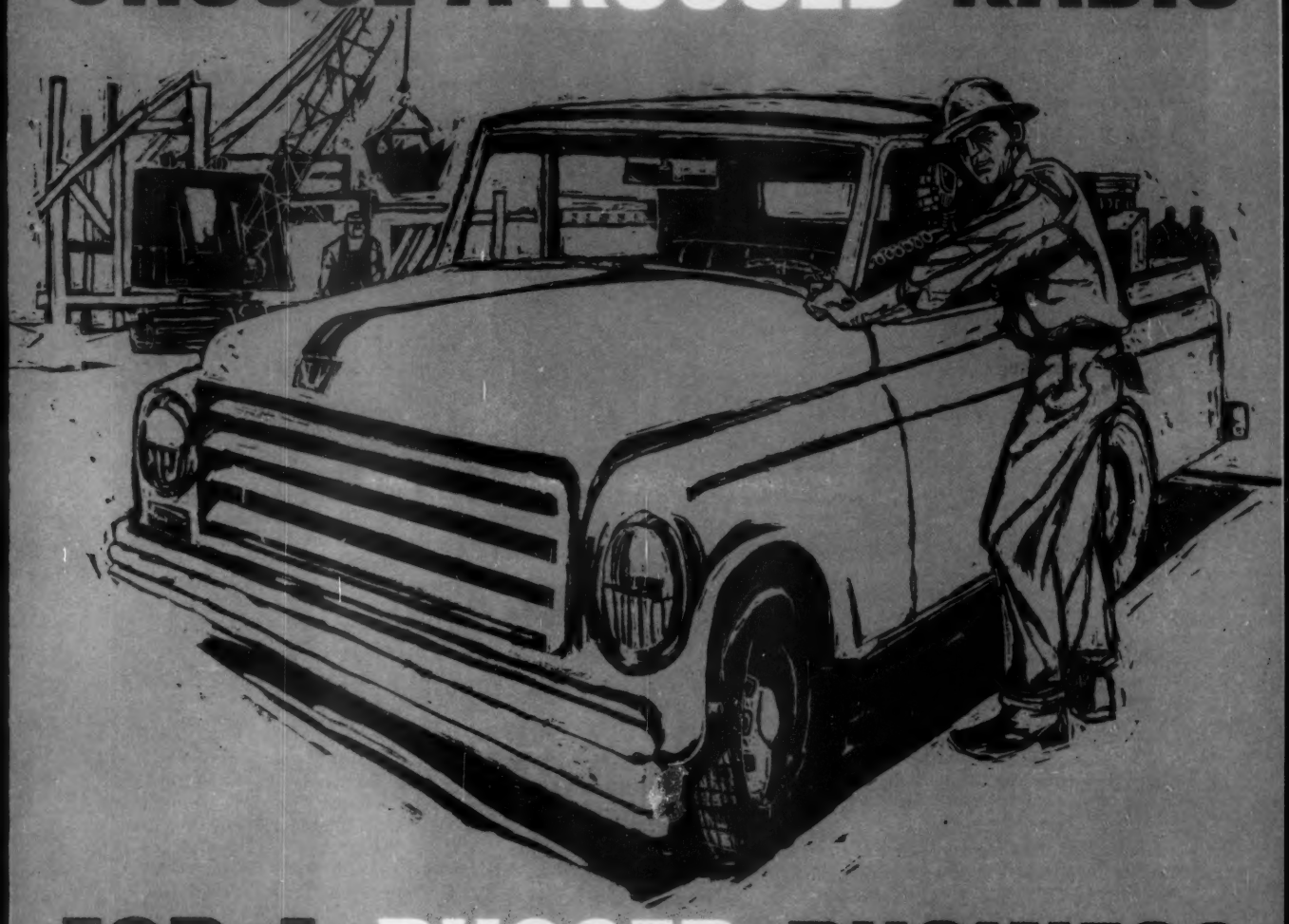
Write, or phone 644-1291.

ARKLA

REYNOLDS GAS REGULATOR CO., INC., ANDERSON, INDIANA

A SUBSIDIARY OF ARKANSAS LOUISIANA GAS COMPANY

CHOOSE A RUGGED RADIO



FOR A RUGGED BUSINESS

YOUR TRUCKS GIVE RADIO A BEATING . . . pounding, jolts, jars, and vibrations—but rugged, tough, Motorola 2-way radio keeps right on working. From the solid 18-gauge steel housing right down to each controlled-quality transistor, here's the radio built for the toughest field service.

Examples? Precision tuning coils are friction-threaded and spring-loaded to stay on frequency, even under severe shock and vibration. Critical selectivity circuits are cast in polyesterstyrene, guaranteed for the life of the radio. Every major component is firmly fixed to the chassis, secure against breakaway and "whip" damage. The result? Longer equipment life . . . fewer outages . . . lower maintenance and **lowest communications cost.** For complete information write dept. AGA 112.

MOTOROLA
2-WAY RADIO

Motorola Communications & Electronics, Inc.
A Subsidiary of Motorola Inc.
4501 Augusta Blvd., Chicago 51, Ill.

We've often been asked why a Straight-Thru-Flow gas pressure regulator is capable of high flow regulation, yet is still sensitive enough to compensate for minute inlet pressure changes.

It would be logical to expect forces exerted by the rushing gas to cock the valve to one side, causing binding of the stem and reducing sensitivity: However, Straight-Thru-Flow's patented design calls for a low-friction valve guide on the outlet side of the regulator to compensate for this. The guide maintains alignment of the valve stem and guide hole centerlines, even when inlet pressures are high.

Straight-Thru-Flow regulators thus offer the perfect combination of capacity and sensitivity for efficient operation—anywhere.

NO REGULATOR PERFORMS QUITE LIKE A MAXITROL

MAXITROL COMPANY
23555 Telegraph Road Southfield, Michigan

ANDERSON TUBING PULLER

— pulls flexible tubing through pipe or bores

Expansion gripper instantly takes hold inside the tubing; the stronger the pull, the tighter the hold; inward thrust permits immediate withdrawal. Tubing is never damaged. Peening, brazing and cutting are eliminated, saving time. Sizes for tubing from ½ to 1½.

FREE LITERATURE

ANDERSON & GRUNSKY

P. O. BOX 455, SANTA CRUZ, CALIFORNIA

Manufacturers of time-saving Anderson Test Plugs and Pipe and Tubing Pullers

New refrigerator plan studied in New York

New York's Board of Health decided not to ban gas refrigerators all together after all. Neither will it ban them in all but one- or two-family houses. The original proposal by Deputy Commissioner of Health Jerome Trichter called for banning gas refrigerators in all but one- and two-family homes.

Trichter was advised by the board to draw up regulations to deal with the gas refrigerator problem. These regulations will generally adhere to recommendations already put forth in a letter by the American Gas Association.

Industry representatives voiced support of a program to combat the problem that arises when carbon monoxide fumes escape from faulty gas refrigerators.

These proposals are:

1. Ban water cooled models.
2. Provide for non-corrosive flue systems, a specific type of burner with appropriate brackets and accessories, and the elimination of nonrepairable units.
3. Mandatory registration by owners, periodic inspection and upgraded servicing by qualified, certified people.
4. Recognition of the advances in technology that have evolved "self-policing" gas refrigerators.

The proposals in the letter are supported by Brooklyn Union Gas Co., Consolidated Edison Co., Long Island Lighting Co., Norge Sales Corp., Whirlpool Corp., GAMA, Refrigeration Trade Association of New York and the AGA.

Florida's resorts switch to gas

Peoples Gas System of Florida reports a steady flow of conversions from oil to natural gas by resorts in Florida's famed Gold Coast and West Coast areas.

Latest in the list, according to President P. C. Crowen, are the Golden Strand Hotel and Villas, Thunderbird motel and executive apartments, all in the Miami Beach area.

Other Florida landmarks on Peoples' mains which have converted from oil to natural gas include the Fontainebleau, Miami Beach's biggest resort hotel; Bal Harbour's noted seafood restaurant, the Lighthouse; and Tampa's Columbia and Las Novedades restaurants.

Gas dishwasher shown at Florida convention

An all-gas kitchen is possible now with the introduction of a gas dishwasher by Preway Inc.

Preway's gas dishwasher, the result of 15 years of research and development, incorporates sound hydraulic and mechanical principles, plus four basic features which set it apart from other dishwashers. According to Preway's vice president, sales, Harvey T. Anderson, these four features are: (1) radial wash arms; (2) complete flexibility in racking; (3) thermostatically controlled gas water heater; and (4) high temperature sanitation rinse and drying zone.

Water is distributed through slowly revolving radial arms from both sides of the tub. Raised ports in the arms scientifically direct water distribution. Racking is designed so that dishes, cups, and glasses will receive a direct water force in any location in the machine.

Water is preheated by means of a burner to a thermostatic requirement of 160 deg. before the unit goes into the wash cycle. The cycle consists of one 10-minute wash and two 6-minute rinses. In the second, or final, rinse, the water is preheated to 180 deg., the temperature required to meet federal health and sanitation code requirements.

The washer has a capacity of service for 12. Thus, it can do the breakfast, lunch and dinner dishes for a family of four in a single operation.

World's Fastest, Smoothest Hand Reaming

1/8" to 2" Capacity

Self-Feeding RIDGID® No. 2-S Spiral Reamer

...reams pipe, conduit, sheet metal and wood!

Try a RIDGID Spiral Reamer, and you'll quickly feel how it reams its way into pipe, conduit, metal holes or wood without effort. Heat-treated cutting edges give maximum service life. Ratchet-action handle makes work easy in close quarters.

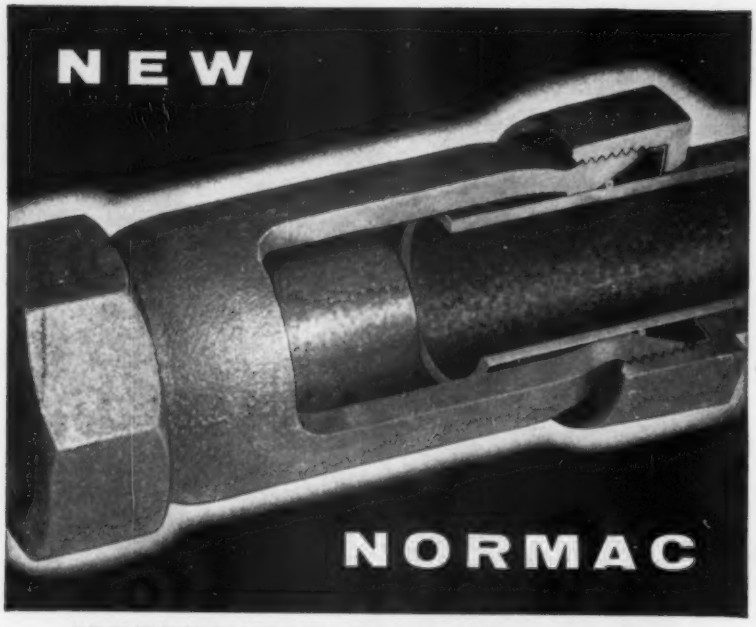
Now Available...
RIDGID No. 254 Spiral Reamer
for 2½" to 4" Pipe and Conduit

No more hand filing . . . here's the time-saving, large-size hand reamer you've always needed. Light, hollow construction makes handling easy. Hand grip has large butt plate for body pressure.

Call your Distributor today. For your convenience, he maintains a complete stock of RIDGID Work-Saver Pipe Tools and parts!

RIDGID

The Ridge Tool Company, Elyria, Ohio, U.S.A.



MODERNIZED Extra Heavy Wall All-Malleable COUPLING Provides More Deflection Than Ever

Engineered in line with latest data on distribution pressures and installation ease. Inspect its construction and quality materials in detail. (Available with Normac INSULATING gaskets).

BRASS FITTINGS
IRON BODY COCKS
INSULATING GASKETS
SELF-LOCKING JOINTS
BELL JOINT CLAMPS
SERVICE TEES, ELLS
METER BARS
COUPLINGS

MALLEABLE SERVICE ELL
Maximum stab. All sizes, with or without insulating gaskets. Also in brass 1¼ I.P.S.

BRASS FITTINGS
The most complete line for copper or plastic tubing in ⅝, ⅞, 1⅛, 1⅜ O.D., 1¼ I.P.S.

Top Quality for 22 Years in Gas Distribution Equipment

Get helpful CATALOG 12. Photos, specs, detail drawings & much helpful data for modernizing or new installations.

PERMANENCY Rely on NORTON-McMURRAY for the finest! NORMAC continues to modernize and improve couplings and fittings in step with latest gas distribution demands. 22 years experience concentrated on ONE purpose . . . the BEST! Today, major gas distribution companies say "NORMAC" to define their standard of quality.

NORTON - McMURRAY Mfg. Co.
919 N. Michigan Ave • Chicago 11, Ill.

1897 1961

PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN STOPPER CO. INC.

GOODMAN — USED SINCE 1897 — 2" HANDLE & LOCKING SLEEVE — GAS MAIN STOPPER

523 Atlantic Avenue
Brooklyn 17, N. Y.
Cable Address GASTOPPER, N. Y.

Gas air conditioners look toward big year

An expanded range of unit capacities and a major absorption design break-through are expected to nearly quadruple the gas industry's air conditioning "market eligibility" during the next year. Making the prediction was Arkla's general sales manager W. G. Wepfer. He spoke at a press conference at the 15th International Heating & Air Conditioning Exposition and ASHRAE meeting in Chicago recently.

Wepfer said that while gas possessed unit capacities and designs to compete in only about 20 per cent of the total central-system market in 1960, it anticipates being able to compete for about 80 per cent of the market in a year or so.

Arkla showed engineering models of the first three of at least nine new gas-fired small-tonnage units planned for introduction during the next year. All are "All-Year" cooling and heating units.

Arkla's expanded line of central units is aimed at helping achieve an announced gas industry goal of one air conditioning sale out of every four by 1965.

"With this accelerated pace of absorption research and development, the gas industry anticipates attaining this sales goal considerably sooner than that," Wepfer said.

The industry's 1961 goal is 25,000 units—more than double its 1960 sales.

School report issued by SGA

The gas industry's research report on the use of gas turbines to supply all energy requirements in the modern secondary school is available from the Southern Gas Association. (See GAS, March p. 108.)

The booklet, "A New Look at Schools," was prepared by Goleman & Rolfe, Houston architects and engineers. It shows how a gas turbine will enable the compact school proposed in an earlier study, "Environment for Learning," to operate for less cost than the conventional, non-air conditioned school—and still maintain the first cost savings.

For information on ordering, write SGA, 1524 Life Bldg., Dallas 2.

Plastics pipe used to install air conditioners

Lone Star Gas Co. is using plastics pipe when installing condensing and refrigerant lines for large home air conditioning units in Greenville, Texas.

The company uses between 20 and 200 ft of Republic Steel Corp.'s FE plastics pipe at each job site, depending on requirements. The flexible pipe is swerved around obstacles along the route between the conditioning units and the houses.

Most of the all-gas units called for the use of 1¼-in. plastic pipe. To connect the ends of the pipe lengths, FE is clamped over a plastic coupling which is then inserted into the pipe lengths. In most cases, a two-man crew can install a unit and its condensing lines to the house in less than a day and a half. Where insulation is required, the plastic line is slipped into a large diameter flexible pipe insulation material.

A workman connects plastics pipe to a home air conditioner unit.

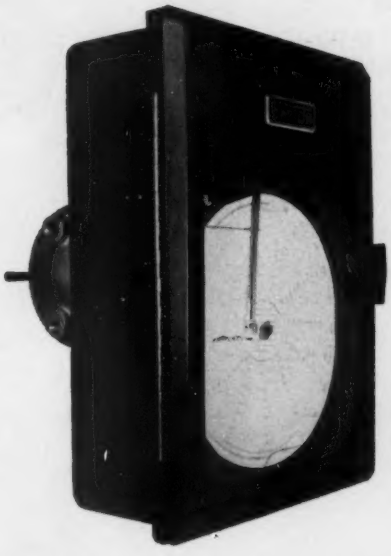
Tariff changes approved

New Jersey's Board of Public Utility Commissioners approved several Public Service Electric & Gas Co. tariff changes.

The Newark-based company modified its gas rate schedule to provide a lower rate for summer gas air conditioning in commercial and industrial establishments.

A new rate for interruptible gas service and changes in the electric power rates for very large users were also introduced.

THE FLOW RECORDER YOU CAN COUNT ON



Absolute dependability, under the most demanding operating environments—that's the promise and the performance of the Barton 202A flow recorder. Thoroughly proven in the gas production fields, the 202A is enjoying ever-increasing popularity in gas transmission and distribution systems. It is compact and ruggedly built, not subject to the usual frailties of such a precise instrument; it has built-in overrange protection, which allows it to maintain calibration under wide pressure fluctuations; it is immune to condensate problems, making it ideal for application in all geographical areas. A recently added bonus: the 202A can be fitted with the new Barton chart changer which allows the instrument to record continuously and unattended, for up to 16 days, using a fresh chart each day. For complete information and specifications on the 202A flow recorder, request Bulletin 202A-1.

BARTON

RECORDER-INTEGRATORS/CONTROLLERS/DIFFERENTIAL PRESSURE INDICATORS/PNEUMATIC TRANSMITTERS/FLOW SWITCHES

BARTON INSTRUMENT CORPORATION • MONTEREY PARK, CALIFORNIA

complete Lancaster main movement assembly

FASTER INSTALLATION

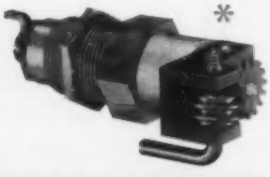
LONGER LIFE IN METER

GREATER METER ACCURACY

Every quality part in this improved Lancaster Complete Main Movement Assembly with new hex is designed to make it easier to install for proper centering and easier adjustment for correct balanced stroke. Saves time . . . assures **real** accuracy . . . keeps meters in service longer. Upper and Lower Main Movements, Valve Cranks are available separately—or order entire Assembly ready to install.

* New Hex Speeds Tightening

For 1-A and #240 Gas Meters



IMPROVED Lancaster COMPLETE INDEX DRIVE ASSEMBLY

New hex saves time and trouble in installing. Adjustable worm axle dog simplifies correct positioning. Quality made for lifetime service once it is installed.

Lancaster

METER PARTS CO.

Manufacturers of Quality Parts for Gas Meters

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Plastic standards published

Developments within the plastics pipe industry are reflected in a recommended Commercial Standard for Schedule A Type I and Schedule A Type II, polyvinyl chloride pipe.

Covered are outside diameters and tolerances; minimum and maximum wall thicknesses; inspection procedures; and identification markings for 11 sizes of lightweight PVC pipe.

Limited copies of the recommended Commercial Standard, designated TS-5523, are available from the Commodity Standards Division, U. S. Department of Commerce, Washington 25, D. C.

Arkansas Louisiana may buy Memphis gas division

Overtures are being made by Arkansas Louisiana Gas Co. to buy the gas properties of the Memphis (Tenn.) Light Gas & Water Division.

ALG president W. R. Stephens said his company "is prepared to make the city of Memphis a firm, attractive offer to purchase its natural gas system."

He said the proposed $10 million to $20 million purchase price "is not a final figure."

Filmstrips available

Encyclopedia Britannica Films has produced a series of six filmstrips in color on "Our Public Utilities."

One, "Gas for the Community," shows how gas companies provide essential services to communities; explains where gas comes from, and enumerates some responsibilities gas companies have to their customers.

Additional information and prices are available from Encyclopedia Britannica Films, Wilmette, Ill.

New division set up

Eastern division headquarters for Cascade Natural Gas Corp. have been established in Walla Walla, Wash., with Ernest W. Jorgensen, vice president, in charge.

Cascade's expansion plans are progressing rapidly, Jorgenson reports, with new franchises in Madras, Redmond, Prineville, and Arlington, Ore. and Othello and Quincy, Wash.

GAS • News Notes

Harper-Wyman's Mexican subsidiary, Harper-Wyman de Mexico, S. A. de C. V., has opened a new plant and office building in San Bartolo, Naucalpan, a suburb of Mexico City. The new plant has 17,000 sq ft of manufacturing space and 5000 sq ft of office and service facilities.

Kwik-Mix Co., Port Washington, Wis., has named Chesapeake Supply & Equipment Co., Baltimore, a distributor. Chesapeake's territory includes Maryland and parts of Virginia, Delaware, and the District of Columbia.

General Controls Co., Glendale, Calif,. is sponsoring a scholarship at Stanford University in Palo Alto, Calif. Honoring the late William R. Ray, one of the founders of the firm and father of the president and three vice presidents, the fund makes $1000 available each year.

Oronite Division of California Chemicals Co., San Francisco, has started a plant in Mexico to manufacture lubricating oil additives. The plant, known as Quimica Oronite, S. A., is located 10 miles from Mexico City. It will be operated by Casa Molina-Font of Mexico City, Oronite's licensed distributor in that country.

Reeves Brothers Inc. and Shell Chemical Co. have entered into an agreement to develop polypropylene for use in the fiber field. Intensive research is already under way toward the development of special grades and modifications of polypropylene which are especially suited for the manufacture of high-grade fibers.

Because of diversification. Minneapolis-Moline Co., Hopkins, Minn., is changing its corporate name to Motec Industries Inc. The Farm Equipment division will continue to use the traditional Minneapolis-Moline names.

CUT 20" CAST IRON PIPE
in Less Than 8 Minutes...

...with the New REED
ROTARY CUTTERS
(4 sizes cover the range from 10" cast iron to 26" steel pipe)

These one-man Reed Rotary Cutters cut large diameter steel or cast iron pipe *faster and better than the heaviest power machines* . . . and without electrical or explosive hazards. What's more, there's less digging in ditch-work! You need only a 4" to 6" channel under the pipe and a 45° to 60° arc for the handle swing. Reed Rotaries are easy to "carry in", too. The 20" size weighs only 68 pounds; separates into 3 easily carried parts. Patented pipe guide assures clean, right-angle cuts. Four razor blade wheels track perfectly, cut easily and are quickly interchangeable for steel or cast iron pipe.

• Write today for descriptive literature.

These typical cuts on 12, 16, 20 and 24" cast iron pipe illustrate the clean, accurate, right-angle cuts provided by Reed Rotary Cutters.

REED
REED MANUFACTURING COMPANY
ERIE • PENNSYLVANIA

GAS DIGEST

New Products and Trade Literature

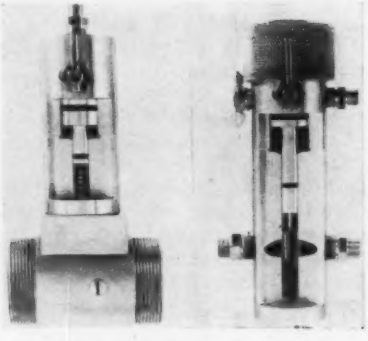
For more data on any of these items use the Readers' Service Card on pages 85, 86

1. Meter box

Handley's new meter box is made of a rubber-resin compound (GEC-560). The lightweight box can't rust or rot and it is impervious to weather conditions. Available in several models, the box is adaptable to a variety of service entrance situations. A large plexiglass window permits quick meter reading.
Handley Industries

3. Earthmover

Ulrich's 6H Varidozer is a utility bulldozer with wide range of hydraulically controlled blade positions (GEC-210). It can be changed in seconds from a straight blade to an angle blade, forward V, reverse V, tilt blade, or to any combination of these positions. Four hydraulic levers control the entire cycle of positions.
Ulrich Manufacturing Co.

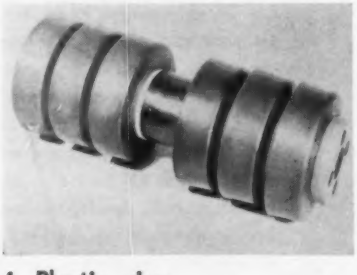


5. Safety sentinels

Happy Co.'s new Schafer oil and heat Sentinels are designed to cut off any engine powered by gas or liquid when the oil pressure of the engine drops to a pre-designated low, or the heat generated rises above a set danger point (GEC-200). The Sentinels will fit any engine and are dust, water, vibration and corrosion proof.
Happy Co.

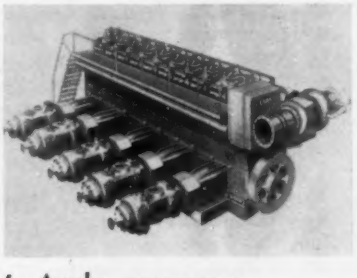
2. Tape dispenser

A snap-action, clean - cutting, positive feed dispenser for Thred-Tape pipe joint sealer is available from Crane Packing (GEC-730). It provides a simple, convenient and dirt-proof device for handling the tape. The dispenser consists of a transparent plastic case upon which the chrome-plated cutting and dispensing mechanism is mounted.
Crane Packing Co.



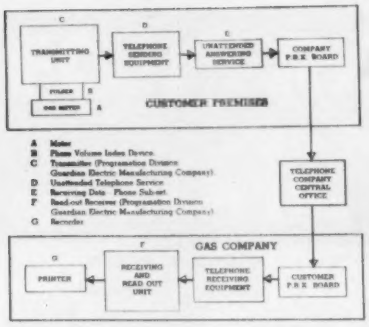
4. Plastic pigs

T. D. Williamson is producing new lightweight, plastic separation and displacement pigs (GEC-720). The new pigs separate dissimilar fluids, displace gases with liquids and liquids with gases, remove condensates from gas lines, etc. Operational advantages include minimum slippage and minimum pressure differential.
T. D. Williamson Inc.



6. Angle compressor

Clark Bros. has developed a modified version of its Model TLA gas engine-driven compressors for the 1500 to 3000-bhp range (GEC-160). The new Model TBS supplements the TLA in intermediate hp steps. Combined with TLA units, the new line makes a full range of models available to meet any pipeline or process requirements.
Clark Bros. Co.



7. Remote meter reading

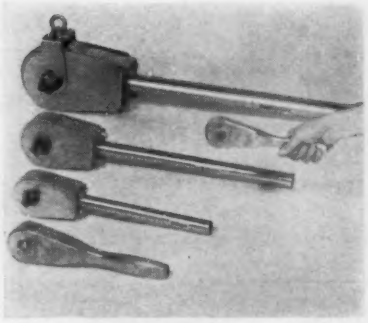
Guardian Electric has introduced its new remote meter reading equipment (GEC-750). Principal equipment includes a transmitter and read-out device. Each system could use presently installed, privately owned transmission lines routed independently through a private switchboard, or by direct wire to a central monitor.
Guardian Electric Mfg. Co.

8. Service tees

Continental's new line of steel service tees features the self-punching device (GEC-370). Threaded into the high strength steel body, the hardened punch not only taps into the main, but it serves as a shut-off valve as well. Available with a ¾-in. body and threaded and compression outlets ranging from ¾-in. through 1¼-in.
Continental Industries Inc.

9. Gas range

Whirlpool's 1961 gas range line features big cooking capacity supplied by two ovens (GEC-240). The new built-in appearance stems from snug front-to-back and between-cabinet installation. New is the gourmet shelf built into the backguard; counter control center featuring "pop-up" control knobs; and see-through oven doors.
Whirlpool Corp.

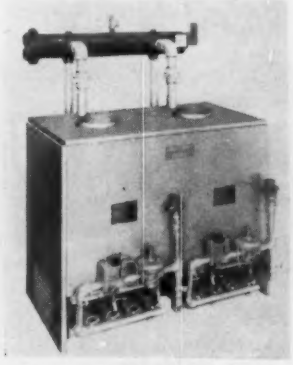


10. Hand tools

Curtiss-Wright has introduced a line of portable wrenches (GEC-770). The Swench requires neither auxiliary equipment nor power connections. It is available in eight models and six sizes. One model is a non-magnetic, non-sparking type for use in hazardous proximity to combustibles. It is made of impact-resistant bronze.
Curtiss-Wright Corp.

11. Data processing

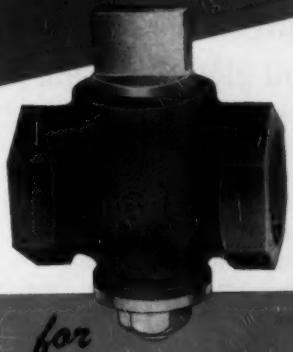
Burroughs' new solid state electronic data processing system overcomes problems of wasted manpower and unused speed (GEC-180). The medium-priced B5000 cuts programming time and problem-solving costs. It schedules and keeps track of its own work load, and actually tells itself as well as its human operator how it's doing.
Burroughs Corp.



12. Hot water boiler

Hydrotherm's new Laundro-Temp hot water heating plant is designed for self-service and commercial laundries (GEC-860). The compact, heavy-duty unit features cast-iron construction combined with all-copper heat exchanger which is directly flanged to the boiler and efficiently heated by thermo-siphon effect.
Hydrotherm Inc.

HAYS
Iron Body
Brass Plug
Gas Stops



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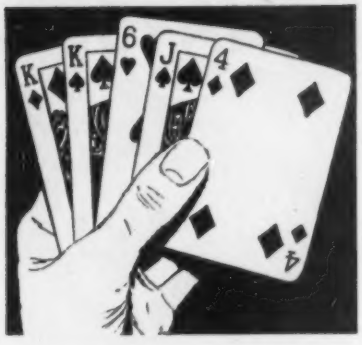
METER SETTINGS
and
SERVICE LINES
Flat Head
•
With or Less Check Pin
•
Lock Wing

for
INDUSTRIAL USE
with Square Head

Also Available in
TAMPER PROOF
and
LUBRICATED PATTERNS

GENERAL PRODUCTS DIVISION
HAYS MFG. CO.
ERIE, PA.

POKER? Play to win!



How would you play this hand?

Odds are 50-50 you're high hand before the draw. Open, or if you're to left of opener, raise. Don't stay on less, though. Queens or under most times are drawing against a better hand.

Here's a sure winner from FORD:

Two new Ford Tractors built for half-yard loading, for 10 ft. or 12 ft. digging!

New 4000 Series Industrial Tractor for work demanding up to 42 drawbar horsepower; new 2000 Series for work requiring up to 32 drawbar horsepower.

Gasoline or diesel, choice of transmissions, job-matched with dozens of front, side and rear attachments.

Get details from your Ford Tractor Dealer, or write:

Tractor and Implement Division
Ford Motor Company
Birmingham, Michigan

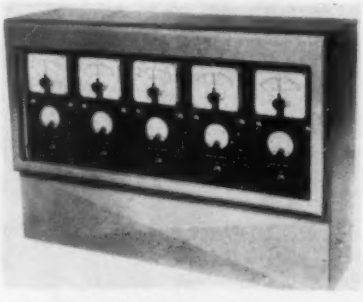
Ford
TRACTORS
EQUIPMENT

13. Heating equipment

Mueller Climatrol's new line of winter air conditioners meets demands for both economy and deluxe installation (GEC-420). As standard equipment, the new 119/219 heating line includes large capacity blowers with special mounts to reduce operation sound levels. The series is designed for easy adjustment to "continuous air circulation."
Mueller Climatrol

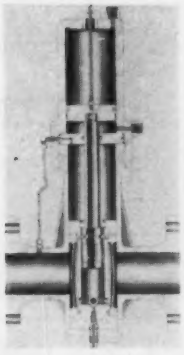
14. Fluxless solder

A low temperature fluxless solder, Tin-A-Lum, has been developed for use on aluminum and its alloys, zinc, tin, pewter, magnesium, and other metals as well as castings (GEC-570). The solder is said to melt at extraordinarily low temperatures, thus eliminating the danger of metal destruction under heat.
Metals For Industry Inc.



15. Gas detector

The Multitector provides a central control housing for multipoint monitoring of the presence and concentration of hazardous, combustible gases at varying locations (GEC-465). Detection is performed by sensing elements located at the desired points or areas and connected to the central unit by cables which can be up to 1500 ft long.
Houston Instrument Corp.



16. Pipeline valve

A new type of high pressure pipeline valve with design emphasis on automatic control has been developed by Kexplore Inc. (GEC-820). The line-operated valve is remotely controlled inherently and may be operated by line pressure alone, or by normal pneumatic, hydraulic, and electric systems. Seal is leakproof.
Kexplore Inc.

17. Numerical speeds

Numerical reports and documents can now be printed at speeds up to 1285 lines per minute by the IBM 1403 printer, more than double the 600-lines-per-minute alphanumeric printing rate (GEC-180). Replaceable chains offer a variety of type arrangements and styles. The "numerical printer" more than doubles the output potential.
IBM Corp.

18. Ditcher

Vermeer's new W-1 Pow-R-Ditcher digs up to 8 in. wide and is the smallest Vermeer ditcher (GEC-210). It features all-hydraulic ground travel, regardless of digging speeds or transport speeds. The unit has 4-wheel drive on 4.00x8 tires or is equipped with crawler tracks. Special ejector paddles allow dirt to be deposited neatly over a wide area.
Vermeer Manufacturing Co.

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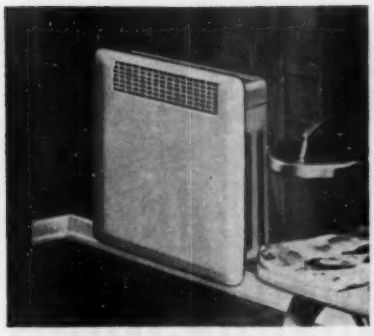
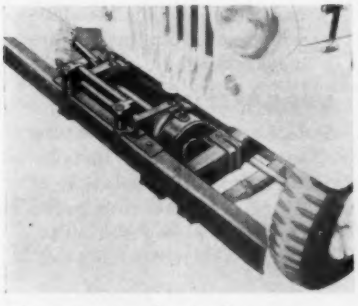


19. Hot water unit heater

Iron Fireman has developed a hot water unit heater which can operate off the same tank that supplies hot water for baths, laundry, and dishes—local codes permitting (GEC-420). The new heater houses, or contains, its own water pump. It is designed chiefly to provide supplemental heat for hard to heat rooms or to heat added-on areas.
Iron Fireman Mfg. Co.

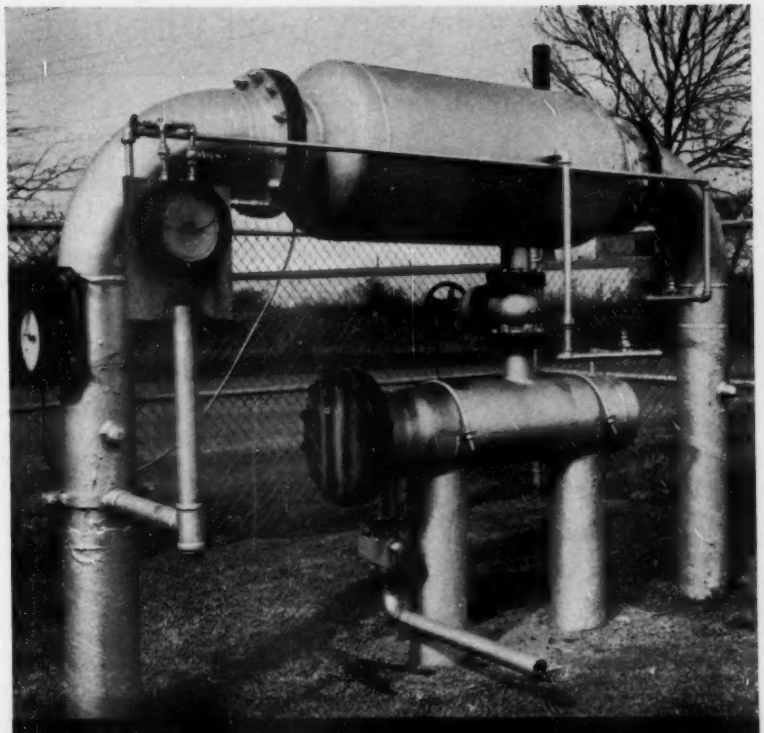
20. Fuel cell kit

Allis-Chalmers has a fuel cell demonstration kit that produces electricity from chemical reaction using a basic fuel-cell principle (GEC-450). Fuel used is alcohol; the oxidant is hydrogen peroxide. Electrolyte is potassium or sodium hydroxide. It will operate a 1.5-v motor for about 15 minutes on one fueling.
Allis-Chalmers Mfg. Co.



21. Front-end winch

A new front-end winch for the Universal Jeep has been developed by Braden Winch (GEC - 790). Three models are available. Each has a safe working load of 8000 lb. The three speeds forward and one reverse in the Jeep transmission are transferable for winch operation. It may be used in conjunction with or independent of the Jeep's own motive power.
Braden Winch Division



Problem:

ELIMINATE PILOT and BURNER STOPPAGE

Due to Heavy DUST Accumulation

Solution:

HI-EF GAS LINE SCRUBBER—To prevent pilot and burner stoppage and protect one American 500-B Meter from dust accumulation, a TYPE LDS 12-LP Hi-eF Gas Line Scrubber was installed in a feeder main supplying residential and industrial areas.

Results:

This unique purifier with no moving parts, removed ¼ to 15 quarts of dust per day at 30,000 to 300,000 SCFH of natural gas at 12 to 13 PSIG. Customer complaints ended—dust accumulation ended.

More Information:

Whether your separation problem be dust or liquid, there's a Hi-eF Gas Line Scrubber to meet your requirements. Write for Bulletin 601 or ask for an Anderson Engineer to call.

Hi-eF PURIFIER

By the Manufacturers of Super-Silvertop Steam Traps

THE V.D. ANDERSON COMPANY

Division of International Basic Economy Corporation

1981 West 96th Street Cleveland 2, Ohio

DIGS DEEPER: 15'
MORE REACH: 20' 8"
DUMPS HIGHER: 12' 6"
SWINGS A FULL 190°

Parsons-Shawnee

NEW 1500...

BIGGEST BACKHOE

On the Market

Here's more reach, more digging depth, more loading height than any other tractor-mounted backhoe in the business. Pulls up to 4 payloads a minute. Makes bell hole and spot excavation work easier anywhere. Fits all popular make tractors — new and used!

HYDAWAY-HYDRAULICS
Cylinders, rams, and hoses are tucked away, shielded from dirt and hard knocks of close-quarter work. A Shawnee exclusive.

NON-SKID STABILIZERS
Independently controlled telescoping stabilizers provide firm footing, level machine on uneven terrain.

3-POSITION DIG-ALL BUCKET
Handles all excavating jobs easily . . . including straight down spot digging. Sizes from 16" to 36" widths.

Send for bulletin today!

PARSONS CO.
Shawnee Dept.
NEWTON, IOWA

A Division of KOEHRING Company

Please send new booklet on your 1500 backhoe. -5103—GAS

Name _____
Dept. _____
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City _____ State _____

TRADE LITERATURE

22. Line pipe

A new 28-page brochure highlights A. O. Smith linepipe (GEC-620). The brochure describes manufacturing facilities and quality control. Bulletin CP-92 also gives tables of sizes and weights, covering wall thickness, fraction inches, and decimal inches.
A. O. Smith Corp.

23. Air conditioners

Descriptive literature is available on Arkla's new Series 650 Sun Valley all-year air conditioner (GEC-020). The gas absorption unit delivers 4.3 tons of cooling. Introduction is also planned of Model 650C "remote" and 655C remote add-on cooling units.
Arkla Air Conditioning

24. Earth equipment

The complete line of Ka-Mo earth and rock boring transmission units, auger sections and accessories are described and illustrated in a 12-page bulletin (GEC-210).
Ka-Mo Tools Dept.

25. High-speed computing

A bulletin from Bendix describes the G-20 high-speed computing system (GEC-180). Bulletin OC-020-R110 details outstanding operational features, including the recently announced improvements in computing, magnetic tape, and line printer speeds.
Bendix Computer Division

26. Goggle valves

Koppers has published a brochure on the design, operation, and specifications of the mechanical goggle valves (GEC-820). The valves are for use in steel mill gas mains and will be made in a range of sizes to fit gas mains from 24 in. to 108 in. in diameter.
Koppers Co. Inc.

27. Frequency response

Fisher's research staff has prepared a 12-page bulletin on "Fundamentals of Frequency Response" (GEC-450). Bulletin TM-6 provides the practical instrument man with a rudimentary knowledge of the terminology and a basic understanding of this relatively new technique in the control field.
Fisher Governor Co.

SERIES 1400 REGULATORS

For every domestic installation

ADAPTABILITY
Reliance Series 1400 Regulators are available in a wide variety of models. Designed for convenient installation, inspection and maintenance where space limitations are encountered.

VERSATILITY
Union-type, removable pipe section simplifies installation. Full 360° rotation of diaphragm section gives complete piping flexibility. Detachable meter bar available for compact, easy installation.

DEPENDABILITY
Manufactured in conformance with ASA Code B31.1.8-55. Maximum inlet pressure 125 psi.

See Bulletins 100 and 102.1 for details.

AMERICAN METER COMPANY

Sales Offices in Principal Cities

28. Gas compressors

A 10-page illustrated brochure No. 124 covers White Diesel's recently introduced line of heavy-duty, balanced-opposed compressors (GEC-160). These units are for gas gathering, gas lifting, repressuring, and booster service.
White Diesel Engine Div.

29. Low-pressure regulators

A new 4-page bulletin covers Reliance Type A low pressure regulators for domestic appliances and commercial and industrial applications (GEC-700).
American Meter Co.

30. Coated fabrics

A new 12-page catalog on Reevecoat industrial coated fabrics has been published by Vulcan (GEC-560). Physical properties, performance characteristics and applications of more than 200 different styles of fabrics are listed.
Reeves Brothers Inc.

31. Venting handbook

William Wallace Co. has published the "Metalbestos Gas Vent Tables and Handbook" (GEC-840). It presents complete capacity tables for Type B large diameter, commercial-size vents up to 24 in. These tables range to 10 million Btu per hour appliance input. The handbook also treats in text and in illustration scientific data of particular value to the gas heating industry.
William Wallace Co.

32. Controllers

A 56-page catalog covers the complete line of ElectroniK controllers — pneumatic and electric (GEC-750). Detailed, illustrated Catalog C-15-2a covers new modular design features as well as the new proportional plus reset plus rate control units, partial chart listings, and pneumatic and electric contact control forms.
Minneapolis-Honeywell

33. Relief valves

Reliance Type ASO relief and back pressure valves are described in Bulletin 115 from American Meter (GEC-820). The valves are recommended for back pressure service on vapor recovery and butane systems and similar applications involving relief pressure as low as 3 in. w.c.
American Meter Co.

Two Koppers Cold Foggers arranged for single or parallel operation with automatic control. This is one of two gate station installations serving the City of Clearwater, Fla. Each provides a total maximum fogging capacity of approximately 3 gallons per day.

to protect gas distribution systems, reduce "unaccounted for" and control dust problems

By introducing a fine oil fog into gas mains, Koppers Oil Foggers reduce maintenance of meters and regulators, condition main joints, minimize leakage, control dust problems and reduce service calls.

Koppers Cold Foggers are available as stock items in capacities as low as 1 gallon per day. Hot Oil Foggers for gas, steam or electric heating, are made in a wide range of capacities, as much as 200 gallons per day. For full information write to: KOPPERS COMPANY, INC., Gas Apparatus Dept., 2004 Scott St., Baltimore 3, Md.

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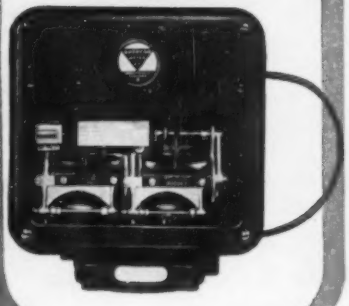
GAS APPARATUS

Designers and builders of gas holders and gas plant equipment for more than 80 years

Inspection, repair and service of gas holders

Accurate Flow Volumes at All Times

with an American® Base Volume Index



American Base Volume Indexes register the measured gas quantity at standard conditions of base pressure and base temperature on a direct reading counter. No computations... accurate gas volumes are shown continuously and immediately.

A second counter also indicates the gas volume at line conditions. Simple operating principle... integration is continuous with all functions performed mechanically through special gearing.

Write for Bulletin 200 for complete information.

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AMERICAN® METER COMPANY

INCORPORATED ESTABLISHED 1836

General Offices: Philadelphia 16, Pa.
Sales Offices in Principal Cities

people • *Continued*

from page 68

BOB LEE CORBELL from residential heating and air conditioning representative in the Houston-Pasadena service area to residential air conditioning sales supervisor for Houston (Texas) Natural Gas System.

PRENTIS COBB HALE, chairman of the board of Broadway-Hale Stores Inc., elected a director of Pacific Lighting Corp.

WARREN H. DICKINSON named product sales manager for the pipe protection products for the electrical and magnetic products group, International division, Minnesota Mining & Manufacturing Co.

HERBERT W. SEARS succeeds FRANK M. REINHOLD as vice president of purchasing for the Connecticut Light & Power Co., Berlin, Conn. Reinhold is retiring after a career which began in 1923 when he joined CL&P's engineering department in Waterbury.

MRS. LAURA PIEPGRAS joined Peoples Natural Gas, division of Northern Natural Gas Co., as home service director in the Omaha office.

LESILE FOURNIER, vice president and treasurer of Panhandle Eastern Pipe Line Co., was elected to the board of directors of National Distillers and Chemical Corp.

CAPT. IVAN MONK, USN (Ret.), joined De Laval Steam Turbine Co., Trenton, N. J., as manager of the service and repair department.

W. J. GREENWALK named general manager of Humble Oil & Refining Co.'s new natural gas division. JOHN J. CARTER was appointed manager to assist Greenwalk in gas sales.

WILLIAM H. JAYNES appointed general manager of the Protective Coatings division, Pittsburgh (Pa.) Chemical Co.

CORDER S. REYNOLDS from project engineer to assistant chief engineering, Columbia Gulf Transmission Co., Houston. He replaces CHARLES W. MORROW, who transferred to Ohio Fuel Gas Co., Columbus, as assistant chief engineer of the Columbus Group companies.

TORTURE TEST

The young lady in the picture is determined to take some of the zing out of that spring. But she'll never get any place. The springs used in a CHECKER fleet car are practically indestructible. They have to be, for the taxi-proven CHECKER fleet car is built to last 100,000 to 150,000 or even 200,000 low-cost miles. When a CHECKER finally does wear out, its owner has long since gotten his money's worth...in lower maintenance costs, better gas mileage, fewer repair bills. May we suggest you give a CHECKER your own torture test. You'll be amazed at how much it can take.

Check into CHECKER the TAXI-PROVEN fleet car

CHECKER MOTORS CORPORATION

DEPT. 40 Kalamazoo, Michigan

JOE B. BYRD named sales representative for the Houston office of Stupp Corp., Baton Rouge.

W. D. MOORE named assistant to the sales manager for pipeline products in the Protective Coatings division of Pittsburgh (Pa.) Chemical Co.

LESLIE T. FOURNIER, vice president and treasurer of Panhandle Eastern Pipe Line Co. and Trunkline Gas Co., elected a director of Hugoton Production Co.

WILLIAM H. DAVIDSON, JR., from chief trial counsel to general attorney for Transcontinental Gas Pipe Line Corp., Houston.

J. C. DEZELLE named vice president of the Texas Distribution division, United Gas Corp., Shreveport. The 29-year veteran with United Gas recently succeeded to the duties formerly directed by JAMES A. WILSON, who transferred to Shreveport as vice president in charge of the company's distribution operations.

ROBERT J. STEININGER named manager of claims at Bucyrus-Erie Co., South Milwaukee, Wis., succeeding CARL W. LAUMANN, who recently retired.

CECIL H. KIRK named vice president in charge of operations, Montana Power Co., Butte.

A. C. MCWILLIAM joined the industrial relations department of Commonwealth Services Inc., New York, as a consultant on personnel and other industrial relations matters.

J. H. MOTZ, secretary of Atlanta (Ga.) Gas Light Co., named vice president.

DUANE R. REDMAN, manager of taxes and insurance, elected an assistant treasurer of Ohio Fuel Gas Co., Columbus.

FRANK R. PORATH from rate engineer to analytical and computer engineer and JOHN H. WOY from rate department supervisor to rate engineer, San Diego (Calif.) Gas & Electric Co.

FRANCIS R. LEONARD from manager of industrial relations to assistant vice president for industrial relations at Laclede Gas Co., St. Louis, Mo.

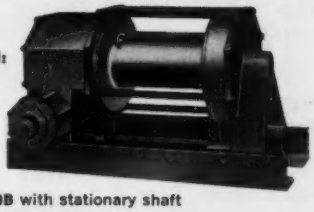
Koenig INTRODUCES A REVOLUTIONARY NEW TYPE OF HEAVY-DUTY POWER WINCH

FEATURING TORQUE TRANSMISSION DIRECT FROM GEAR SPIDER TO DRUM . . . NO KEYS TO SHEAR

20,000 pounds safe hoisting capacity

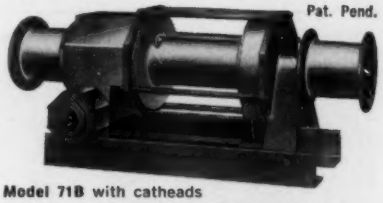
Outstanding features of the NEW KOENIG WINCH:

★ Drum torque load is NOT transmitted by drum shaft . . . no keys to shear . . . torque is transmitted direct from gear spider to drum by means of multiple-splined collar in gear housing.
★ Entire unit, including safety brake, is lubricated by the oil-bath principle, with a generous supply of oil to prevent overheating.
★ Engineered to use standard lubricants available throughout the world.
★ Multiple-plate automatic safety brake, running in oil with one-direction clutch, is easily adjusted or released.
★ Accurate drum clutch position indicator.
★ Gear ratio — 38:1.
★ Nickel-bronze alloy worm gear. Hardened and ground worm mounted on Timken roller bearings.



Model 70B with stationary shaft

Pat. Pend.



Model 71B with catheads

THIS ADVANCED-DESIGN KOENIG WINCH IS RECOMMENDED FOR OIL-FIELD EQUIPMENT, PUBLIC UTILITIES, HEAVY WRECKERS, CONSTRUCTION, AND OTHER HEAVY-DUTY JOBS.

Koenig winches have served the industry with dependable pull and hoisting power since 1934. Koenig also builds a complete line of utility and service bodies.

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FAST! RUGGED! HYDRAULIC!

Digs 3" to 12" Widths

Equipped with 18 hp. engine, the rugged Model W-3 POW-R-DITCHER is ideal for contractors, municipalities, utilities and custom operators. Rubber-tired wheels or crawler tracks. Hydraulic drive system — no shifting. 2-way dirt conveyor. Ask for a demonstration.

PICK THE POW-R-DITCHER TO FIT YOUR NEEDS

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4T

W-1

3P

Please send me FREE information and prices on the complete Vermeer line of self-propelled POW-R-DITCHERS.

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FIRM.....

ADDRESS.....

CITY.....STATE.....

☐ Also include information on new Vermeer hydraulic back filler.

VERMEER MANUFACTURING COMPANY

1441 W. WASHINGTON • PELLA, IOWA

JAMES M. HUGHES from general sales manager of Reactive Metals Inc. to sales manager, regular products, of Dresser Manufacturing Div., Dresser Industries Inc., Bradford, Pa. He will direct the promotion and sale of all Dresser pipe joining and pipe repair products.

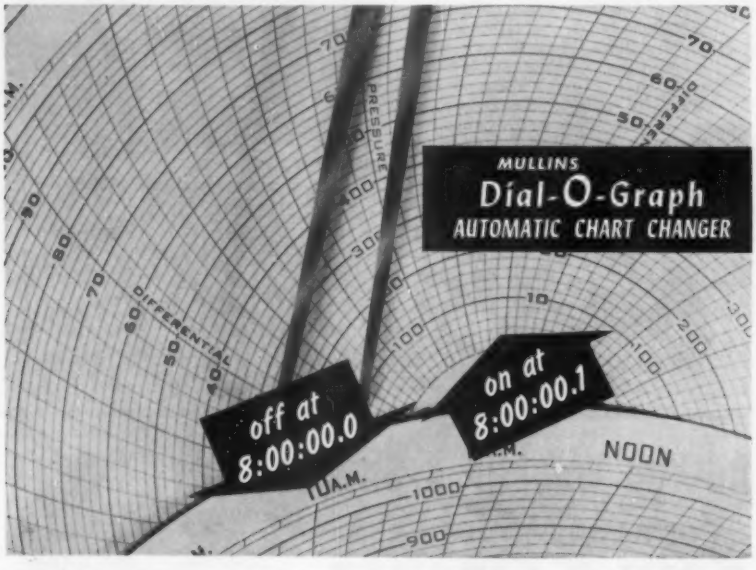
PIERRE R. VINET joined Caloric Appliance Corp. as a sales representative in Nebraska.

J. E. MACCONVILLE named sales coordinator, Special Systems division, and FRED B. AKERSON named Atlanta Regional industrial sales manager of Minneapolis-Honeywell Regulator Co.

DON ELLIS named district sales manager for Caloric Appliance Corp. in southern California.

PHILIP A. JENKS named director of sales of the Quick-Way Truck Shovel Co., Denver.

CHARLES R. WOODS named staff engineer, Honolulu Gas Co.



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The fastest, most efficient and dependable chart changer available . . . allows recorders to operate unattended . . . allows every recorder in your plant or system to be correlated to the same chart change time.

- Charts dial off instantly, no interruption of recording
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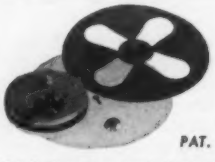
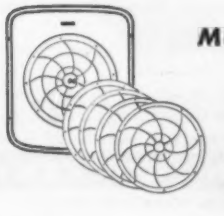
- Field-proven . . . long used by most major gas companies
- Does not effect operation or appearance of recorder
- Charts handle, stack, and integrate as usual
- Current chart is always in view; completed charts are safely stored chronologically in chart catcher under recorder
- Capacity up to 50 charts in one loading

Write for illustrated literature with full details and prices. No obligation.



Dial-O-Graph is a simple, 3-piece attachment—Dial, Chart Plate, and Chart Drive (Mac-Nick)—that fits all recorders. Charts are slotted only in center margin . . . same pattern for all instruments, all change times. (Not shown is transparent guide plate and metal chart catcher for storage of completed charts.)



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Dial-O-Graph
AUTOMATIC CHART CHANGER
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D. W. McCabe
Polyken

W. J. Flaherty
Polyken

KENNETH F. WILLIAMSON from assistant sales manager to vice president and product manager, valves, for Grove Valve & Regulator Co., Oakland, Calif.

L. CURTIS MUNN named superintendent of the gas distribution department and O. BERNARD WEIDEMAN named assistant superintendent, Michigan Consolidated Gas Co., Detroit. Munn succeeds GEORGE M. ARNOLD, who retired recently.

C. A. SPAGNUOLO and WILLIAM E. SCHLEEF named builder sales managers for Whirlpool Corp.'s contract sales division.

WALTER B. VERNER from gas supply engineer in the production headquarters in Amarillo to superintendent of production, Houston operation, Natural Gas Pipeline Co. of America.

WILLIAM J. FLAHERTY from eastern regional manager to Houston manager for Polyken Protective Coatings. While headquartering in Houston, Flaherty's assignment is national in scope. DONALD W. MCCABE replaces Flaherty as eastern regional sales manager.

J. E. HIMMELRICH from regional sales manager in the eastern territory to sales manager for pipeline coatings of the Protective Coatings division of Pittsburgh (Pa.) Chemical Co.

K. F. Williamson
Grove

James Hughes
Dresser

Joseph Robinson
Hill Hubbell

David Knapp
Oronite

JOSEPH R. ROBINSON named Chicago district sales manager for Hill Hubbell Co., Cleveland. He will cover Wisconsin, Illinois, and parts of Iowa and Missouri.

DAVID KNAPP named director and vice president in charge of European marketing activities for industrial chemicals sold by California Chemical Co.'s Oronite division, San Francisco.

BERT F. WHITBREAD named sales manager of Minneapolis-Moline's new Mopower Construction Equipment division, Hopkins, Minn.

DUDLEY E. HEATH named staff coordinator of Arkla Air Conditioning Corp., Evansville, Ind.

LOUIS M. SZABO named sales representative in northeastern Ohio by Caloric Appliance Corp., Jenkintown, Pa.

ROGER ERNST, former assistant Secretary of the Interior, has been named planning consultant for Arizona Public Service Co., Phoenix.

Deaths

STANLEY H. HOBSON, chairman of the board of Geo. D. Roper Corp., in Rockford, Ill., following a long illness. At the time of his death, Hobson was serving as treasurer of the Gas Appliance Manufacturers Association, an office which he had held for the past five years. He served as president of GAMA during the years 1949 and 1950, and served as chairman of GAMA's advisory council from 1953-1955.

WILLIAM LEONE, 52, assistant director of Consolidated Edison Co.'s safety services bureau in Long Island College Hospital.

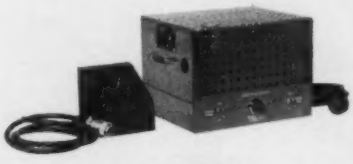
EUGENE C. O'NEILL, 43, midwestern factory representative for McCord Corp., in Tulsa. O'Neill was with McCord for 10 years.

Protective Coating Inspection Problems?

Here's Your Answer

No matter whether you're coating a pipeline or a chemical tank, continuity is vital. Use of a Tinker and Rasor Holiday Detector while the job is open, can save days of downtime later on.

• PLANT AND YARDS



Tinker and Rasor
EPAC Holiday Detector or J-1ACM

EPAC operates off 110 volts A.C. power for stationary coating operations. Internal voltage adjustment from 5,000 to 20,000 volts or with external variable transformer from 500 to 6,000 volts, or 5 KV to 20 KV.

J-1ACM for continuous inspection on coating and wrapping machines which use water for cooling.

• PIPE

Tinker and Rasor
E-P or E-4 Holiday Detectors

Output adjustable from 5,000 to 20,000 pulsating voltage.

E-P—All purpose for larger diameter pipe, damp or dry climate, pre-fab film or hot applied coatings.

E-4—Lower cost, dry surface type of detector specifically designed for smaller diameter pipe and flat surfaces.

• THIN FILM

Tinker and Rasor
M-1 Holiday Detector

For painted or sprayed thin film coatings such as vinyls and epoxies. Maximum applied voltage 67½ V., non-destructive to coatings. Belt mounted, 4-lbs. total weight.

• UNDERGROUND

Tinker and Rasor
Pearson-type Holiday Detector

For detecting holidays and electrical shorts without uncovering the pipeline. Completely transistorized . . . generates 15 watt, 750 cycle, stable A.C. Audio-frequency signal. Adaptable to null search method.

Tinker and Rasor has prepared a complete data kit which describes the null search system as well as other recommended procedures for inspecting protective coatings. Material includes technical data on equipment, general discussion of types of detectors, theory of operations, etc.

Engineering Note:
To insure a perfect application, include Tinker and Rasor Holiday Inspection. Write for specification guide.

Quality Control for Coating Application

TINKER & RASOR

417 Agostino Road, P.O. Box 281 • San Gabriel, California

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Like "Sterling" on silver, SCF identifies the best in Leakage Control Service.

It is a mark that proves your distribution system has had the best in impartial outside leakage control, either survey or repair, without costly build-up of personnel and equipment.

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LOWER SERVICE COSTS with the improved AQUA VALVE BOX LOCATOR!

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- NO WIRES, BATTERIES or SWITCHES—simple, powerful magnetic action, factory adjusted to YOUR geographical location assures unfailing results!
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GAS ASSOCIATIONS

Broad program planned for distribution meet

Headline topics at AGA's distribution and production conference in Philadelphia will range from cooking to the use of liquefied natural gas. Sessions are slated for May 8-12 at Philadelphia's Sheraton Hotel.

General sessions will be held in the morning while in the afternoon smaller meetings of more technical interest have been arranged.

Among speakers at the first general session will be Lester T. Potter, head of AGA and Lone Star Gas Co.; and J. C. Bruckmann, general claims agent of Long Island Lighting Co., who will discuss "Some Claim Factors in Gas Operations."

Tuesday's general session will open with an illustrated talk on gas mapping, stressing photographic techniques, presented by Elmer C. Schroeder, president of Vernon Graphics of Pennsylvania. He will be followed by LILCO's Charles J. Davis speaking on "How to Make a Quality Control Program Work"; Forrest Hammaker Jr., from the AGA Labs, discussing "What's New in Cooking"; C. R. DeHaven of the Philadelphia Gas Works, who will speak on "Customer Opinion Evaluation by Surveys"; and Marvin B. Travis, Northern Natural's safety director, who will discuss "Safety Factors of Corrosion Control Programs."

At Wednesday morning's general session, Solon Walker of East Tennessee Natural Gas Co. will discuss "Corrosion Control and Management." Also on the program are T. L. Robey, AGA's director of research, who will present a research report, and A. H. Mortenson, industrial consultant, discussing "Work Simplification—A Top Management Philosophy."

Dr. Martin A. Elliott, director of IGT will open Thursday's general session with a discussion of the "Availability and Future of Natural Gas." O. A. Gray, United Engineers & Constructors and chairman of AGA's builders subcommittee, will summarize recent developments in gas industry operating machinery.

Automation tops program at transmission meeting

Automation and the use of computers will be stressed at the AGA Transmission conference scheduled for May 25-26 in Denver. About 500 delegates are expected to attend the two-day conference in the Brown Palace and Cosmopolitan hotels.

Some of the speakers include Neal B. LauBach, Colorado Interstate Gas Co., who will discuss "The Integration of Automation in the Gas Industry"; John E. Towle, Columbia Gas System Service Corp., who will give a report on the computer committee; Samuel J. Cunningham of the AGA, discussing pipeline research; and E. E. Stovall, Lone Star Gas Co., "What's Ahead in Gas Measurement."

Corrosion course to hear NACE's Greco

Edward C. Greco, newly elected president of the National Association of Corrosion Engineers, will present the opening address at the 6th annual Appalachian Underground Corrosion Short Course. The three-day school will be held June 6-8 at West Virginia University in Morgantown.

Present scheduling of the program lists about 65 papers covering basic, intermediate and advanced education on corrosion control as related to underground pipe, cable and water systems. Ten new subjects related to these categories will be included.

Further information is available from John H. Alm, 2 Gateway Center, Room 650, Pittsburgh 22, Pa.

GAS DISTRIBUTION ENGINEER

Mechanical Engineering degree preferred and at least two years experience in the Engineering, Installation and Maintenance of natural gas systems. Position offers exceptional opportunity in an investor owned combination gas and water utility in a Wisconsin city of 35,000 people, recently converted from manufactured gas to natural gas and is expanding in all departments.

Maximum Age—35 years old.

Starting Salary—Up to $7,000 per year, depending upon applicant's background.

Send full resume to

Box 1645, GAS Magazine
198 S. Alvarado St.
Los Angeles 57, Calif.

GAS

PIPELINE SECTION

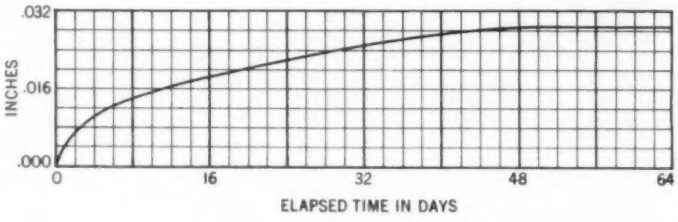
Panhandle revises its microwave system

NEWS FROM DOWN THE LINE!

Are all pipeline insulators as alike as two peas in a pod?

They're not alike, not in physical properties! When plastic insulators first became available for pipeline use, WmSON felt they were inferior to the steel and block types then available. We delayed our entry into the field until we could provide a plastic material to withstand field abuse and wear. We found that material in a high density polyethylene which could be injection molded to provide low cost insulators of the highest quality.

Our decision has proved sound. Breakage and excessive wear of glass fibre reinforced plastics, particularly in large sizes, has created a lack of confidence in plastics in general, but the M-2 Plastic THINsulator® has proved its stamina. Its high resistance to cold flow has been proved. Deflection test results: 1000 p.s.i. on each THINsulator runner for 64 days — total cumulative deflection only 0.029". Max. temp. during test, 105° F., min. temp., 75° F.



Its low coefficient of friction causes it to slide easily inside casing. The M-2 is completely resistant to impact fracture (4.0 ft. lbs./in. notched) and has successfully worked on 36" pipe, ½" wall, pulled in excess of 500 feet. We are convinced that it will perform as well or better than any other insulator on the market, including all known steel types. Other physical properties: *Dielectric strength* — (short time, ⅛" thickness) 500 volts per .001 inches (D149-55T); *Tensile strength* — 4400 p.s.i. at 20 in./min.; *Elongation* — 25% 20 in./min.; *Abrasion resistance* — Taber index 5.7.

The increased acceptance of the M-2 THINsulator has brought production to a level of real economy in injection molding. These cost savings are being reflected in new WmSON prices for 1961.

In planning '61 cased crossings, don't pay a premium for other insulators — use WmSON engineered M-2's and save!

T.D. Williamson, Inc.

P. O. BOX 40 • TULSA 2, OKLAHOMA

REPRESENTATIVES AROUND THE WORLD

Panhandle revises its microwave system

and PEPL Communications Section Superintendent J. A. Fowler tells exactly how it was done

WE at Panhandle Eastern Pipe Line Co. were fortunate enough to be able to make rather extensive revisions to our microwave system in the second half of '60. Since our experience may benefit other communications people in the gas industry, we're glad to share the story of what we've done. That story should properly begin with a limited description of our original system—so you can weigh the rework.

The original 400-mile system was surveyed in 1950, constructed in 1951, accepted and placed in operation January 1952. Our technical staff considered the then-popular conception of 2000 vs. 600 mc. A 6000-mc system was accepted, primarily on two points: (1) Fades —short repetitious as opposed to long duration; (2) No transmission lines, waveguides or above-ground antenna radiators. The second point was quite influential, due to firsthand experience on our VHF base stations. Considerable time and expense was spent on coaxial leaks due to vibration and direct lightning strikes.

On the controversial point of tower maintenance, VHF vs. microwave, it was our experience over the 10 years that microwave towers need neither unusual maintenance nor a concentrated inspection program. To date, all required maintenance has been performed every five years—when the tower is repainted. In the interim, the structure is visually inspected by the tower climber when re-lamping.

Basically, we have been satisfied with our RF equipment. However, when our system was built, microwave had not advanced to using ferrites. Without this decoupler, maintenance problems are encountered —due to frequency drift, change in power mode resulting in reflected distortion, and change in modulation.

Another major maintenance concern with our RF is the so-called "lockout." Most 6000-mc systems transmit and receive frequencies, are 120 mc spaced. When a cold standby is called upon, the frequency rise of the klystron can crossover from transmitter to receiver or vice versa, looping the system. The AFC naturally attempts to pull the frequency in. However, if the rise is on the backside of the discriminator curve, the reverse will occur, pulling the frequency out—rather than in. This problem has been all but solved with the addition of AFC limiter kits. In practice, this revision disables the AFC until the frequency has risen over the backside of the discriminator curve. Upon reaching this point, the AFC is restored and locks to the assigned carrier.

Summarizing, we considered the RF equipment acceptable with one exception, ferrite isolators.

Our staff had never been completely satisfied with the original channeling. It was FM multiplex 12 channel capacity. Two circuits were duplex, eight were simplex push-to-talk, and two were diplexed to 36 channels of telemetry. Again, frequency stability was

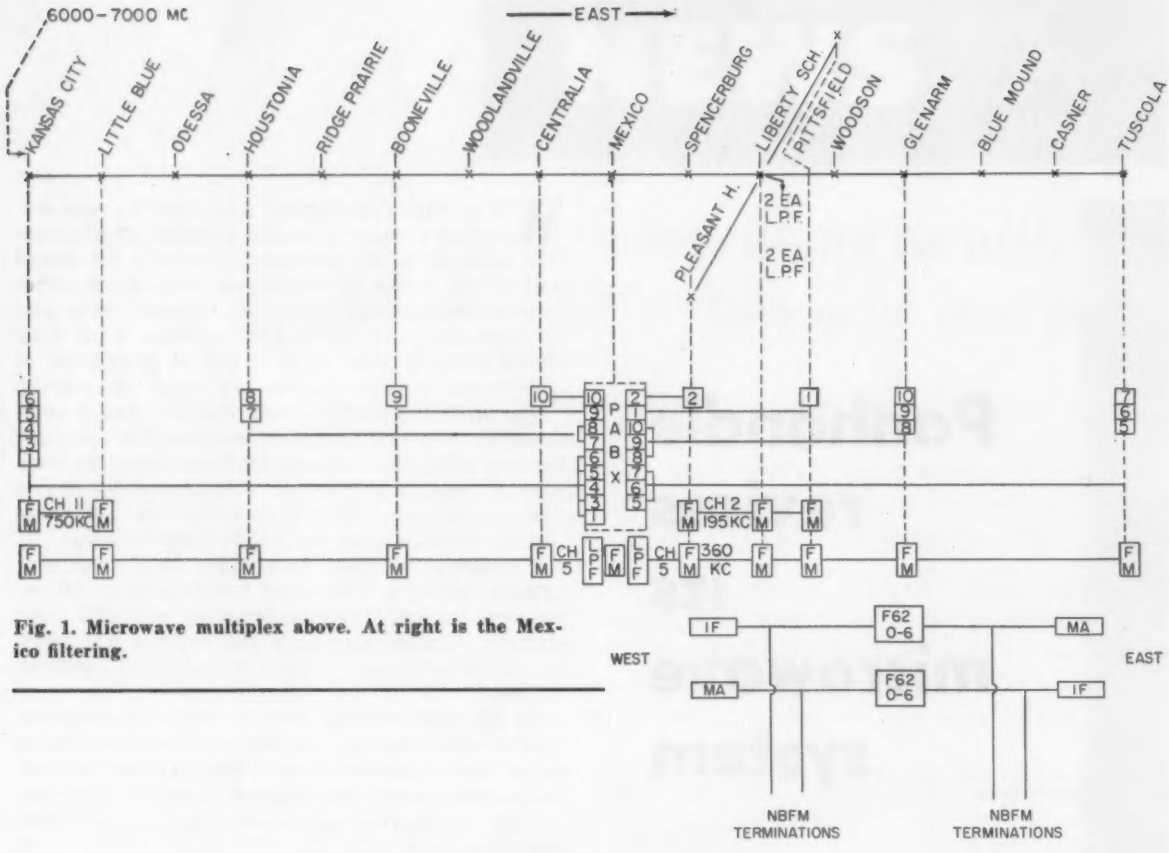


Fig. 1. Microwave multiplex above. At right is the Mexico filtering.

our main concern, along with proper frequency shift for selective signaling. Party-line type operation—as far as frequency density is concerned—is quite conservative. However, traffic capacity is severely curtailed. Traffic between 25-mile stations would busy the entire 400-mile channel. Due to this restriction, we needed additional circuits.

We often wondered why long-haul companies—such as pipelines—were more or less reluctant to utilize private line circuits, retaining party line operation instead. Undoubtedly, this is a holdover from the required-dispatch type circuit and the lack of channelizing equipment at the time of construction.

Although most companies justify their original systems on dispatch traffic, administrative and operational messages have increased to such a degree that dispatch messages are the minority. This was the situation in our telephone plant, which extends some 700 miles west of Kansas City. When we upgraded this facility, all circuits were designed as private line, with the exception of the base band or copper, which remained the dispatch circuit on a push-to-talk basis. Economic studies proved that private line circuitry was no more expensive than party line—with the exception of the investment in a PABX and appliques or line adaptors if station terminated as opposed to E & M trunk. The selective private line revision was accepted enthusiastically by the operating sections. Our field capacity was increased 500 per cent. However, additional trunkage was necessary between the Kansas City operational office and the telephone terminal, some 30 miles south.

Since we were to move the Kansas City administrative office to a new building, it was an opportune time to close the backbone of the microwave system to the telephone terminal and re-channel the existing system to derive needed capacity.

As previously noted, we had no objections to the type of RF equipment. Therefore, no bids were proffered. Conversely, bids were requested for both single-side-band and FM channeling (*see Figs. 1 and 2*). From our recent experience with the telephone plant, our technical staff was prejudiced in favor of single-side-band—although admittedly such equipment would be more expensive. We were concerned with single-side-band application to the microwave as to (a) level stability, (b) filter quality, and (a) party line termination.

Hybrid or drop level of single-side-band channels on a non-ferrited microwave beam would be unstable, resulting in hybrid howl unless regulators were installed. Regulators at each drop-out point made this

equipment less attractive in original cost. Conversely, FM would be essentially self-regulated, due to limiting. Hybrid level would remain stable over wide variation of beam modulation. Single-side-band appeared less attractive after test installations were viewed on a panoramic analyzer. It was quite evident that filters were not of needed quality, although 45 db reject filters can be tolerated in telephone application because of long line attenuation. Inasmuch as microwave is unity gain, no attenuation being present, the unwanted wave forms were present at the terminal and could conceivably contribute to unwanted cross-talk and distortion. It was obvious that standard single-side-band filters of the telephone-carrier variety were not satisfactory for microwave application. Such filters must reject a minimum of —60 dbm. Although single-side-band is available for party line application by 2-wire bridges and auxiliary push-to-talk relays to prevent loop, FM is more applicable in view of the peripheral or outboard equipment.

At the time our staff was weighing the pros and cons, the isoplexor became available. Laboratory tests indicated that the isoplexor would decouple the antennas and give essentially the same reduction in distortion as a 40-db ferrite isolator. A klystron was matched to the antenna load and deviated 3 mc with sinusoidal. Data were recorded under varying temperatures, matched and mis-matched loads. The maximum insertion loss across the required frequency band was 0.8 db and the VSWR was 1.2. Harmonic distortion was only 0.1 of 1 per cent greater than that of the isolator. This unit, although requiring frequency tuning, could be inserted directly in the waveguide between the roof flange and the horn by elevating the dish.

It was quite obvious, from an operational viewpoint, that a far superior end-to-end system would result if we installed FM channeling and used the balance of our authorized expenditure to purchase isoplexors. We then concentrated on FM application with the express purpose of correcting previous errors. Frequency density was adequate for our immediate and future needs. Frequency, in a manner of speaking, was harmonically related inasmuch as they could be in the same octave. Further, S/N & X/T could be reduced by injecting channels only upon PABX seizure. That is, when the remote station comes "off the hook," the transmitter is injected and received at the PABX. The return transmitter is then injected and a dial tone is received by the calling party. Injecting only when the channel is required more nearly approaches modulation consideration of single-side band. By electing a higher octave, we could retain our existing alarm and squelch equipment. In addition, essentially all backbone filters could be removed and no decouplers, auxiliary amplifiers, or impedance matching transformers would be required at drop-out points. Inasmuch as our PABX required DC loop or station termination, we could eliminate outboard appliques and line adapters. With the aforementioned problems and considerations resolved, our staff laid out the system described below.

The RF block diagram (*Fig. 3*) typifies the existing system and the extension to Louisburg. We elected to loop in and out of Kansas City as opposed to a spur circuit from a distant repeater. This decision was basically due to (a) the undesirable filtering and outboard equipment required for a spur, and (b) alternate paths would be available should future urban construction block the path. Note that the new Raymore repeater is so situated that the Odessa repeater can be retired at a future date. The diagrams indicate a frequency difference at Kansas City and Little Blue.

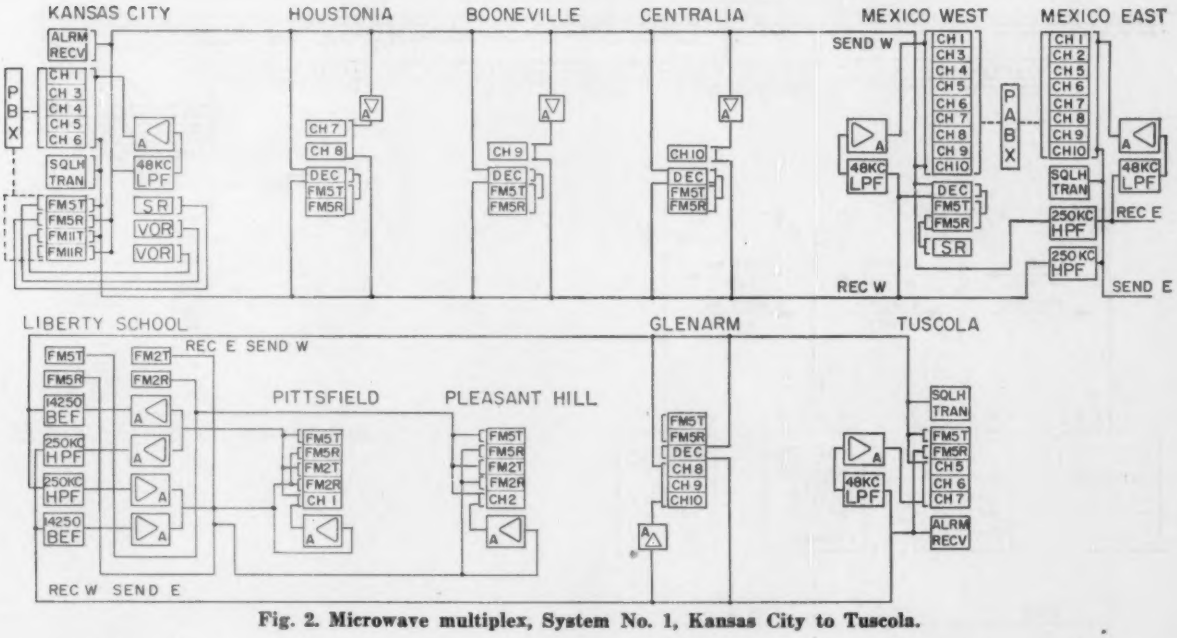


Fig. 2. Microwave multiplex, System No. 1, Kansas City to Tuscola.

Inasmuch as the physical location of Kansas City had been changed, a potential interference problem existed with another microwave user in Raytown.

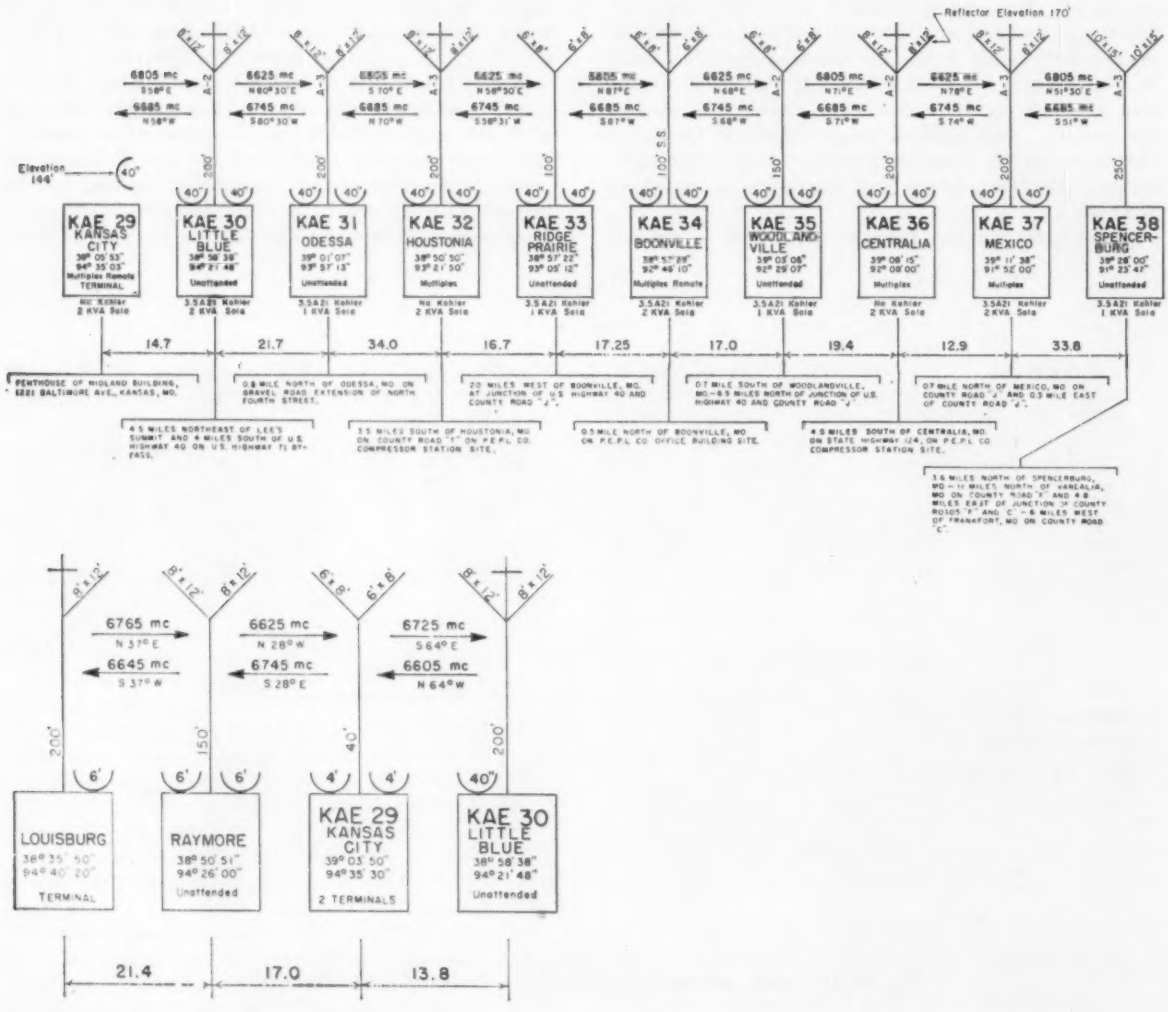
The decision to change frequency was based on EIA's interference formula for free microwave systems: C/N ratio of 0 db or less between related transmitter/receivers. We used the simplified three-step formula antenna pattern instead of an actual pattern with all of the side lobes. A 9-deg sector was assumed to be full gain. A 4.5-deg sector each side of the main sector was assumed to be 15 db gain and the remainder of the pattern assumed to be isotropic. The isotropic sector seemed logical, since the front to back ratio of our 4-ft dishes was —36 db. The theoretical calculations of C/N between the old and the new Kansas City receivers were:

	Old	*New*
Xmtr. Pwr.	+20 dbm	+20 dbm
Antenna Gain (Gt)	0 db	0 db
Path Loss	—132 db	—131.5 db
Antenna Gain (Gr)	+15 db (sector 2)	+39 db (sector 1)
Recvr. Sensitivity	—87 dbm	—87 dbm
Less Cavity Losses		
C/N	—10 db	+14.5 db

Admittedly, there were a great many assumptions. However, a potential interference problem existed. It was to our benefit to change frequencies.

Fig. 1 is indicative of the revised multiplex. The video path was essentially terminated at the Mexico repeater, insofar as the private line circuitry was concerned. Filters were installed to pass the base band spectrum encompassing one simplex push-to-talk pressure dispatch channel, equipment alarms, and supervised squelch. As previously noted, no modulation is present unless circuits are actually in use. We considered—for the benefit of technicians setting unity gain —injecting a pilot tone terminal to terminal. However, we have not determined modulation a requisite to suppress white noise. One channel, at Glenarm and Tuscola respectively, requires off-premise extensions. Pre-

Fig. 3. Schematic diagram of the microwave system

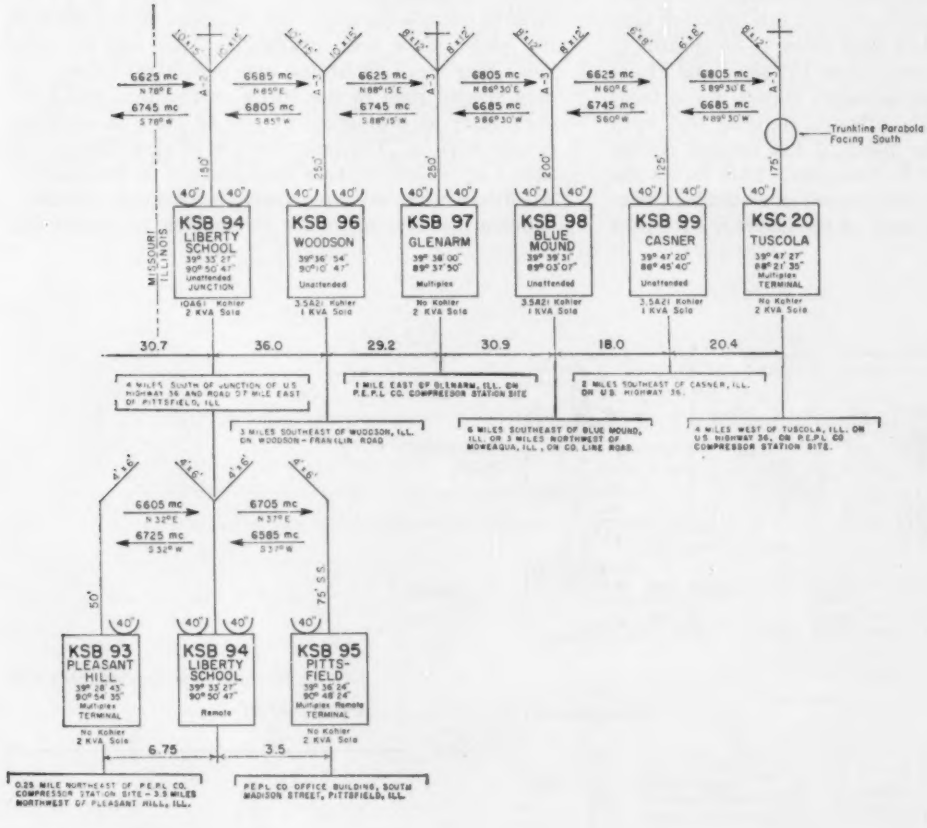


viously, these two circuits were wet line. In the event of a ground or wrap-up on the extension, the simplex circuit would be locked on and would render the channel inoperative. With the revision, we installed dry line adaptors and appliques. (See *Figs. 4 and 5*).

There is nothing unusual about this equipment, since the principle is well known in the telephone industry. The equipment, being special to our needs, was designed and built by our engineers. Because the battery is injected at the extension terminal, any type of long line defect will not seize the switchboard and lock on the channel. The major criticism of this channeling will be readily noted. Should a video failure occur at the Centralia repeater, all private line circuits westward would be excluded from the switchboard. And, no communication would be available. However, the frequency of such an occurrence is minor and the advantages far outweigh the shortcomings. As a back-up, the simplex push-to-talk pressure circuit would maintain essential communications during such an outage, since it is disassociated from the switchboard.

The PABX is a standard board with minor revision. Ninth level is available between the switchboard at Mexico and Louisburg, thereby connecting the two systems automatically without requiring a manual patch by the Kansas City PBX operators. A special link transmitting a constant tone for VHF control is available and will be expounded later. Rotary step-up, meet-me type conference, executive override, and emergency-all-station ring are available. Double supervision prevents disconnect during HF switchover.

As a maintenance and engineering aid we permanently racked a panoramic viewer, oscilloscope, and an electronic counter at Mexico. This is standard equipment with the possible exception of the counter. Our staff designed and built a pre-selector *(Fig. 6)*, which allows analyzing any selected channel without curtailing traffic. This becomes the master frequency standard. The Mexico technician can check the frequency and deviation of any circuit on the beam, regardless of its point of origin or direction of transmission. Also incorporated is a F1A weighing and transmission mea-



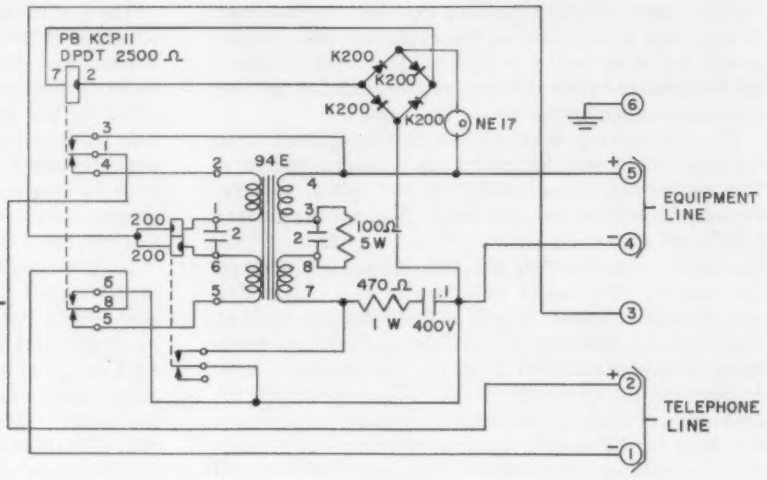


Fig. 4. Dry line applique for remote battery pulsing.

suring set for instantaneous checking of S/N and X/T.

Liberty School is a 4-way junction station. *Figs. 7 and 8* illustrate the filter arrangement before and after revision. In tracing the circuitry, note that stub injections were looped and additive; that full injection latitude is not available; and that there is no control to equalize individual IF output from Pittsfield and Pleasant Hill. This was a burdensome station for a technician, although several outboard controls had been added by our staff. The filters of the revised system are bridged, as opposed to, insertion. This leaves the main line as simple and uncluttered as a standard two-way repeater. The pass band of the filters is such that adequate channel expansion is available to the stub stations. The decoupler is a standard no-gain unit interchangeable with any other on the system. We could have eliminated two of the four filters, had we not desired to exclude the main line channels. Resultant loading would have been negligible. This was not done since they were all bridge and peripheral types. The only special item in the entire installation was a 60-cycle filter at the output of one IF strip to maintain proper sensing. The insertion loss of each filter is less than 1 db within the pass band and a —60 db rejection. All filters were salvaged from the original system.

Some manufacturers are attempting to standardize

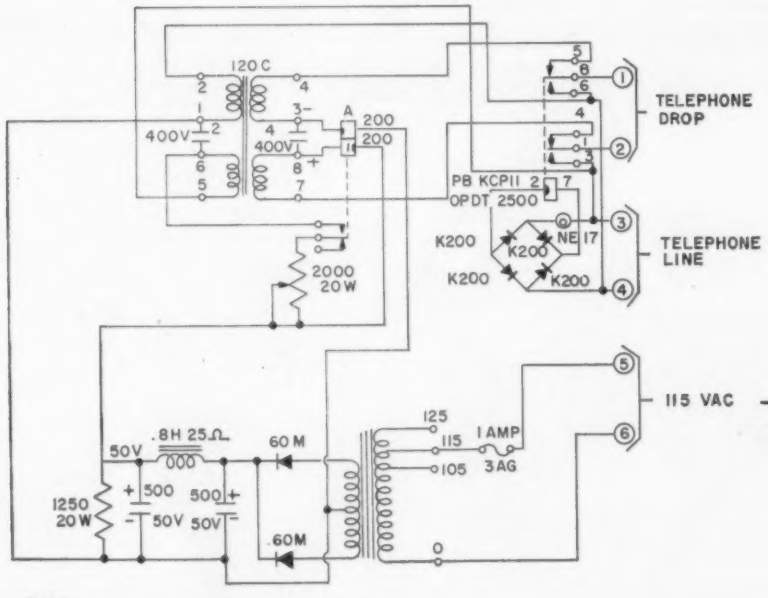


Fig. 5. Metallic line dial adaptor and power supply.

filters so specific combinations with proper strapping will readily provide hi-pass, low-pass or band-pass. This, quite obviously, is advantageous to the supplier. However, it is undesirable to the user. To provide proper isolation each filter has an approximate 13 db loss, thereby requiring the installation of outboard or auxiliary video amplifiers.

We were told that it is no longer economically sound to have special filters made for a specific job. We fully realize that the supplier faces an entirely different problem at video frequencies than at standard telephone frequencies. Regardless of this, we cannot accept the decision. Local jobbers provided us with special filters to designated specifications. Their cost is far less than the total cost of 13 db loss filters, plus the outboard AVA's duplicated for standby purposes. We have found it both economical and feasible to insist on quality filters.

Considering that it's a 1951 application, we do have a rather unique video squelch. It is a company design, born of necessity. At that time, suppliers were working on a noise differential principle. Various revisions were made on the original equipment. None proved satisfactory, mainly due to instability. The video beam would squelch when not required and fail to squelch when a bonafide outage occurred. When the squelch unit operated correctly, there was still no direct indication of the fault unless a technician used outboard test equipment.

Our staff converted a standard single-channel alarm receiver. The alarm operates in the spectrum from 5.1 kc. to 15.5 kc. on 1-kc. spacing. The converted receiver was tuned 500 cycles off to the even kilocycle. The input was bridged directly on one beam with DC relay contacts in series with the opposite video beam. The wiring was revised to normally closed, fail safe, to prevent the beam opening in case of power, tube, or component failure. A squelch tone console was designed and built. Consoles were installed at the Tuscola and Kansas City terminals. The stepping sequence was reversed on each terminal so that the first tone injected on the base band would be to the most remote station.

When a system failure was indicated by noise saturation, the tones would merely be stepped sequentially until quieted. The squelch console was then locked in this position. The reverse procedure would be followed at the opposite terminal. In this supervised manner, communication was restored each side of the break. The location of the defect was known within one repeater or one-half of a multiplex station.

We retained this principle to make limited restoration of the pressure party line circuit and prevent erroneous seizure of the PABX. Currently, we are revising the circuitry to accommodate unlimited supervisory control. This basically requires the mere addition of a selective stepper for the receiver and an encoder for the remote transmitters.

The terminal consoles have been revised for dial operation with selection for individual stations or all-call. There is no restriction of the number of functions, except for the stepper switch, and this can be overcome by using the ninth level principle connecting to a second stepper. Initial functions are: (1) video squelch, (2) bi-lateral RF switching, (3) exercise gasoline

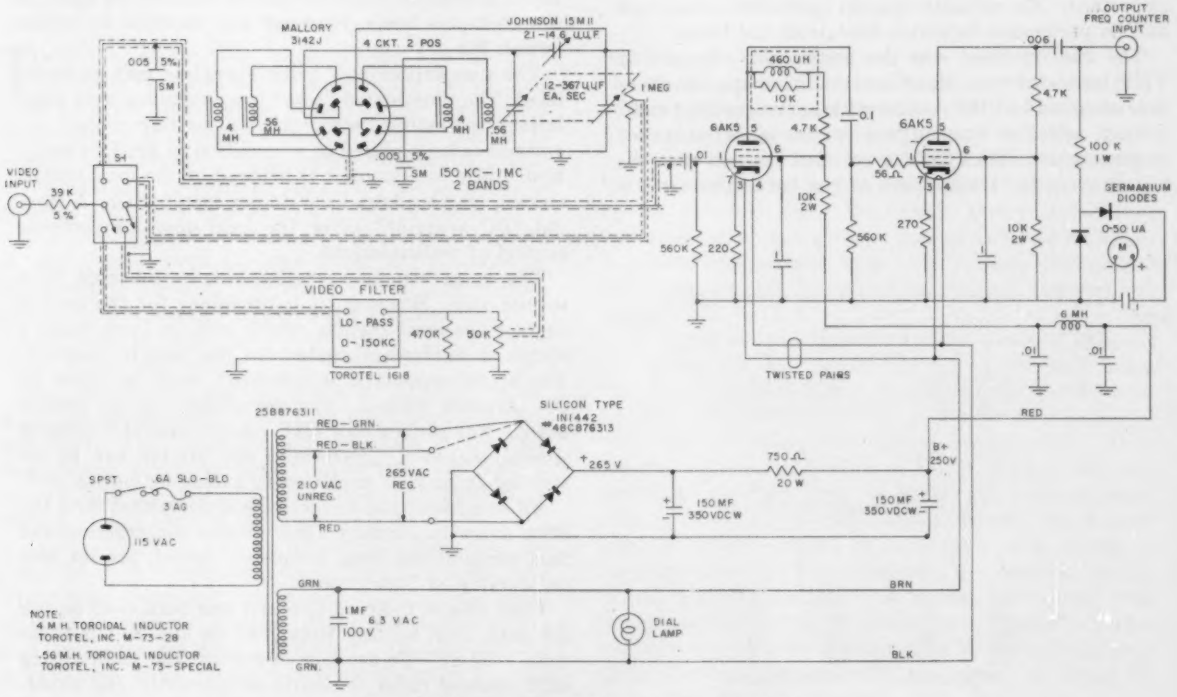


Fig. 6. Microwave multiplex electronic counter.

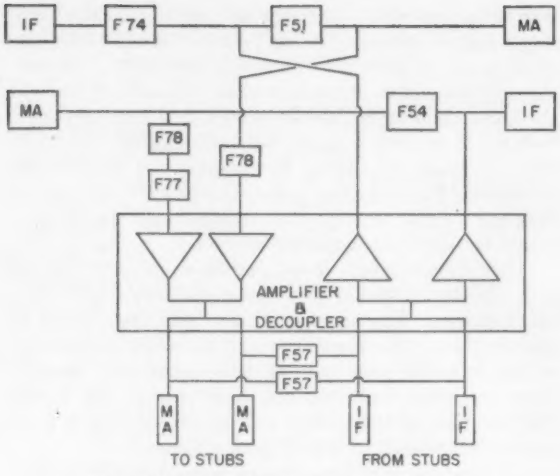


Fig. 7. Liberty School filtering, original.

generators, (4) manual control of tower lights, (5) telemetry, and (6) off/on functions as required by operations. A portion of the Kansas City display panel remains unchanged, insofar as equipment alarms are concerned. If the alarm transmitter is locally energized at the remote station, it is displayed as to station and function identifier. Telemetry is on a challenge basis, in which case the terminal display is transferred to telemetry readout.

This arrangement provides a comparatively simple supervisory facility, reflecting negligible expenditure. It is quite beneficial from a technical viewpoint, since there is no capacity restriction as long as time is not important. No valuable channel spectrum is required and no permanent injection modulates the beam.

The final revision was the integration of existing VHF base stations. Many systems have specific channels assigned to VHF control with party-line type monitoring, selective transmitters or manual interconnect in conjunction with VOR's or rectified limiters on push-to-talk circuits. Irrespective of the particular type, a separate channel is required with drop-outs at each station. In our particular operation, extensive mobile coverage is necessary. We are continually faced with extending the range of base stations. Extended monitoring has not been a requisite.

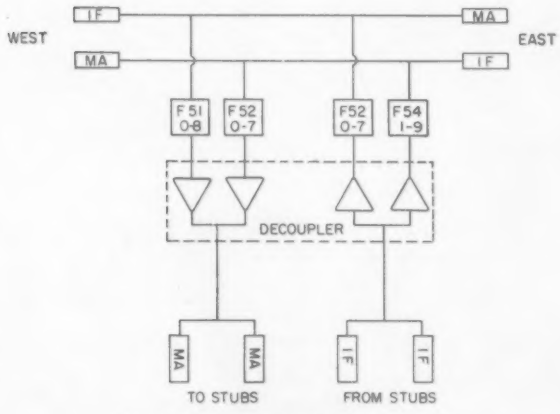


Fig. 8. Liberty School filter, revised.

Although specific operating problems or emergencies dictate the necessity of such dispatch circuitry, traffic most certainly does not warrant separate channels to each drop-out or a selective bridge party line. A method was needed to utilize the standard private line voice circuits for VHF dispatch. One link of the PABX is restricted for VHF. Access to this link may be restricted to any combination of microwave channels.

Operation is eighth level, that is, a station can come off hook, receive normal dial tone, dial number 8 and be connected to the VHF link. A second number is then dialed, selecting the particular base station desired. The switchboard will connect to the standard private line voice circuit. The eighth level VHF link puts out an uninterrupted in-band audio tone which is directionally filtered. That is, the party initiating the call will not hear the audio tone. The tone on the called channel is filtered at the distant station in a similar manner as speech-plus. The output of a tone receiver controls what would normally be the channel's ring receive or drop relay—which has been replaced with "C" contacts and double-wound polarized coil. As long as the tone from the switchboard VHF link is present, the channel will be switched from telephone termination to VHF termination. At this point, complete monitoring facilities of the remote receiver are available. Designated VHF dispatch phones have revised intercom lines and signal buttons. A transistorized tone oscillator is mounted internally with the "sig" key used as push-to-talk switch. Another set of contacts closes a DC circuit to the key lamp on the intercom line. When the "sig" key is depressed, a second tone is transmitted again on a speech-plus basis, received, and rectified to control switch B±.

The transmitter now being energized may be modulated. The illuminated "com" lamp complies with regulations indicating "when the transmitter control circuits have been placed in a condition to produce radiation." The interconnect is bridged on the local control circuit, which allows local duplex monitoring. A manual "DC override" gives the local operator complete control of transmissions.

The same remote operation can be initiated by a mobile unit. However, it is necessary for the unit to contact the local station, which will, in turn, make a standard microwave contact to the remote dispatch. The actual automatic interconnect must be made by the dispatch station. The versatility can be readily noted. Any station has VHF control available without special channels. Conversely, any station can be restricted from such operation by excluding eighth level.

All equipment not in service was correlated with the office move in January 1961. Major construction and field revision had been completed, tested, pre-set, and on standby in "hot" racks.

Field checks indicate C/N not less than —40 db per RF path, S/N not less than —62 db and X/T not less than —57 db. We are now operating and maintaining 6225 channel miles, exclusive of telemetry and supervisory. ■

Remote control of gas wells and gathering lines

By WILLIAM H. SUMRALL JR., Sales Engineer
American Meter Co.

THE increase in the value of gas and its constituents has created a demand for faster and more accurate dispatching. Many wells are located at distant or unattended areas and remote control is necessary to operate these systems efficiently. This is increasingly important when the gas supplies a gasoline plant or a system with a fluctuating load.

The usual method of manually adjusting the choke at one or more wells assumes a constant downstream pressure and demand. Any change in these conditions results in a decrease in the plant efficiency and requires another time-consuming trip to the wells to again adjust the chokes.

One step toward improving the situation is to use a diaphragm-operated choke positioned by a pressure controller. The controller will maintain a constant downstream pressure, but if more than one well is flowing into the gathering system, it will provide no control of the amount of gas leaving each well.

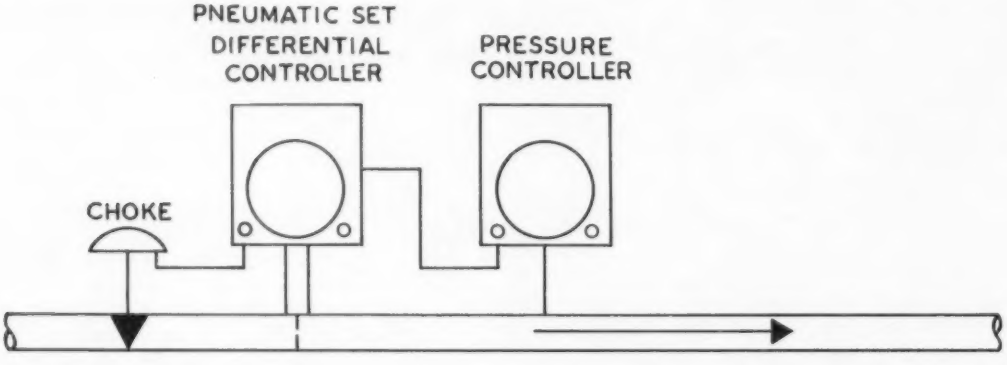
Another method uses a differential controller instead of a pressure controller. This controller will adjust the choke to flow a preset differential and maintain a constant volume, if the downstream pressure remains constant. However, an increase in downstream pressure will cause the choke to be fully opened. As an example, an increase in pressure will decrease the differential and the controller will open the choke to maintain the differential set point. This will continue until the choke is fully opened. Therefore it cannot be used alone.

An obvious solution to the problem is to utilize both instruments; a pressure controller to hold a preset pressure from the choke, and a differential controller and motor valve downstream to maintain a preset differential. With this method, differential and pressure, the requisites of volume rate can be maintained.

Thus far we have obtained volume control. In order to change the rate it is necessary to manually reset the index pointer of one or more differential controllers. These can be reset remotely by two methods: electric remote-set and pneumatic-set. When electric remote-set is used, a small motor in the differential controller case positions the index pointer. The motor has reversible action so that the pointer can be moved upscale or downscale. The signal to energize the motor is actuated by a manual switch in the dispatcher's office and can be transmitted over telephone wire, radio or microwave. Telemeter transmitters can be used as the well site to send differential, pressure, temperature, tank level, or other information that is required.

The second method, pneumatic-set, does not require metallic lines, radio or microwave. It utilizes pressure controllers and pneumatic-set differential controllers. When these instruments are installed properly for a given installation, they will control the wells to flow at a constant pressure and at a fixed ratio of the system delivery rate. The ratio will be maintained even when the system delivery rate is varied.

A pneumatic-set unit consists of a bellows and linkage assembly that positions the index pointer of the controller. The bellows receives the output pressure from a master controller. A span adjustment on the pneumatic-set linkage determines the amount of movement of the index pointer for the 3-15 psi output pressure from the master controller. When used for this application, the master instrument is a pressure controller. Two or more pneumatic-set controllers can also be adjusted to maintain a fixed ratio of flow rates even when the total rate is varied. Mechanical stops are provided that can be set to limit the minimum and maximum travel of the index pointer.



A typical application for this method of control is in a field where several wells are flowing into a gathering system. The diaphragm-operated choke of each well can be controlled by a pneumatic-set controller. The index pointer of the controller is positioned by the output from a pressure controller that receives the downstream pressure. The controllers may be arranged in a different sequence than those used for electric remote-set.

The span dial of each pneumatic-set controller is set at the differential necessary to flow the allowable from the well. If these settings do not provide adequate control, they may be increased by a common multiple. This does not affect the ratio of settings. Assume the daily allowables of the wells are:

Well	Allowable MMcf/day	Per Cent Total	Differential
1	2.0	10.0	36 in.
2	2.0	10.0	36 in.
3	2.0	10.0	36 in.
4	2.5	12.5	56.25 in.
5	2.5	12.5	56.25 in.
6	3.0	15.0	81 in.
7	3.0	15.0	81 in.
8	3.0	15.0	81 in.
	Total 20.0	100.0	

A gasoline plant or other outlet may be several miles downstream. The station can be equipped with a differential controller that will maintain a preset delivery volume since the system pressure is constant. If the controller is set to another delivery rate, the upstream pressure will change and cause a change in the output of each pressure controller. The pneumatic-set controllers will adjust the chokes to the new rate but maintain the fixed ratio of the total delivery.

The differential controller may be electric remote-set, that will permit resetting the total volume rate from another point.

Another type of installation that has utilized pneumatic-set controllers to a good advantage is the central production facility. The gas may enter at high pressure or be regulated by a pressure controller at the well site. Individual flow line heaters are often used on each line. The heater choke can be used as a motor valve and be controlled by a pneumatic-set differential controller.

A pressure controller usually receives the pressure on a central header and positions the pointer of the pneumatic-set controllers in the manner previously described. When the pneumatic-set controllers are located at the central facility, only one pressure controller is usually required for the installation.

Some wells are occasionally restricted to a narrow range of flow rate. The limit stops on the controllers can be adjusted to restrict the index pointer to this range.

The applications discussed have been limited to equipment to adjust gas volumes. However, some transmission companies are controlling compressor stations by remote means. Remote control has increased the efficiency of many gasoline plants, and offshore producing companies have been able to maintain sales that would have been shut-in during inclement weather. ■

This article is adapted from a talk presented at the South Louisiana regional meeting of the NGAA in Lafayette, La., Feb. 24.

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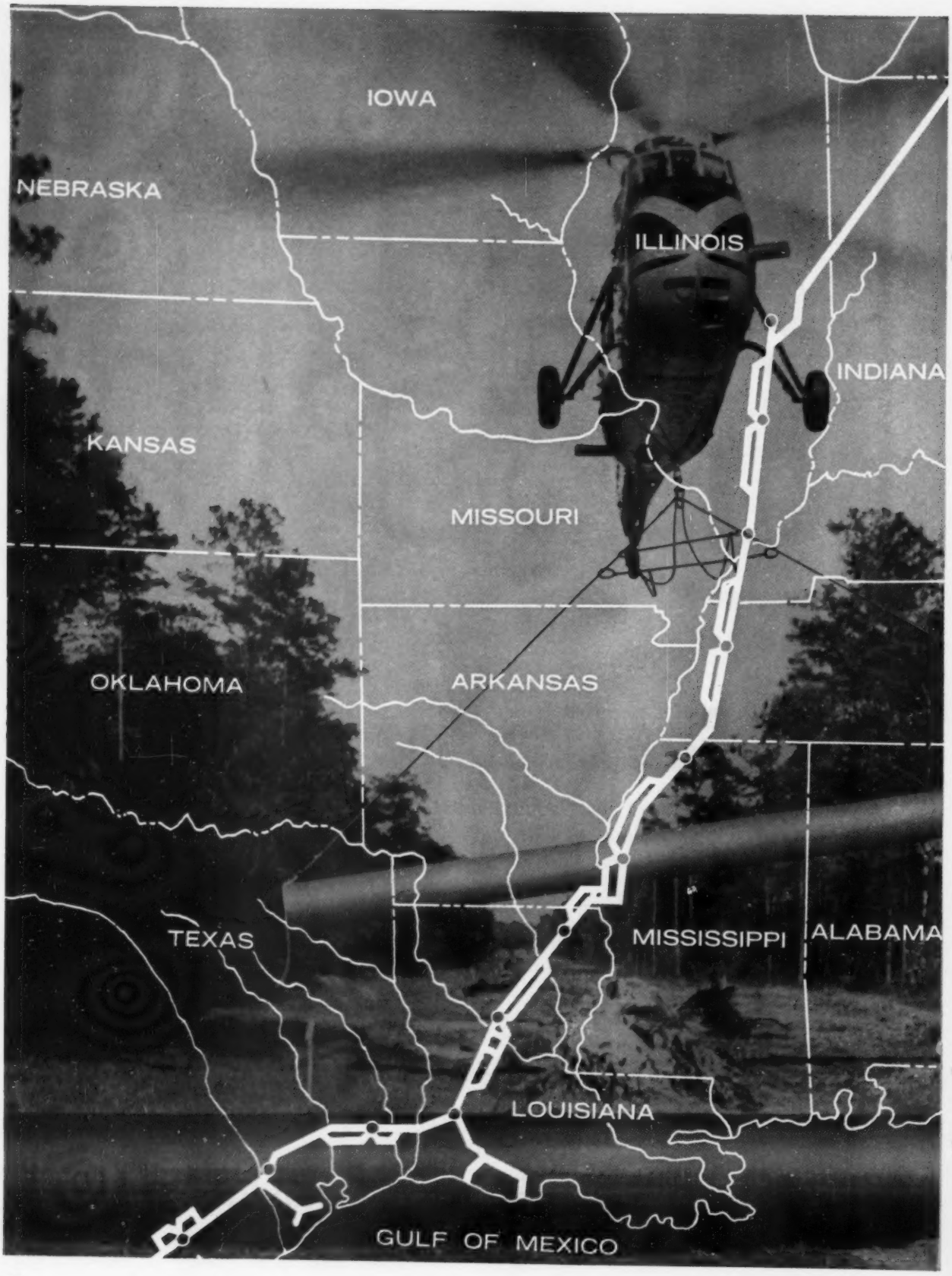
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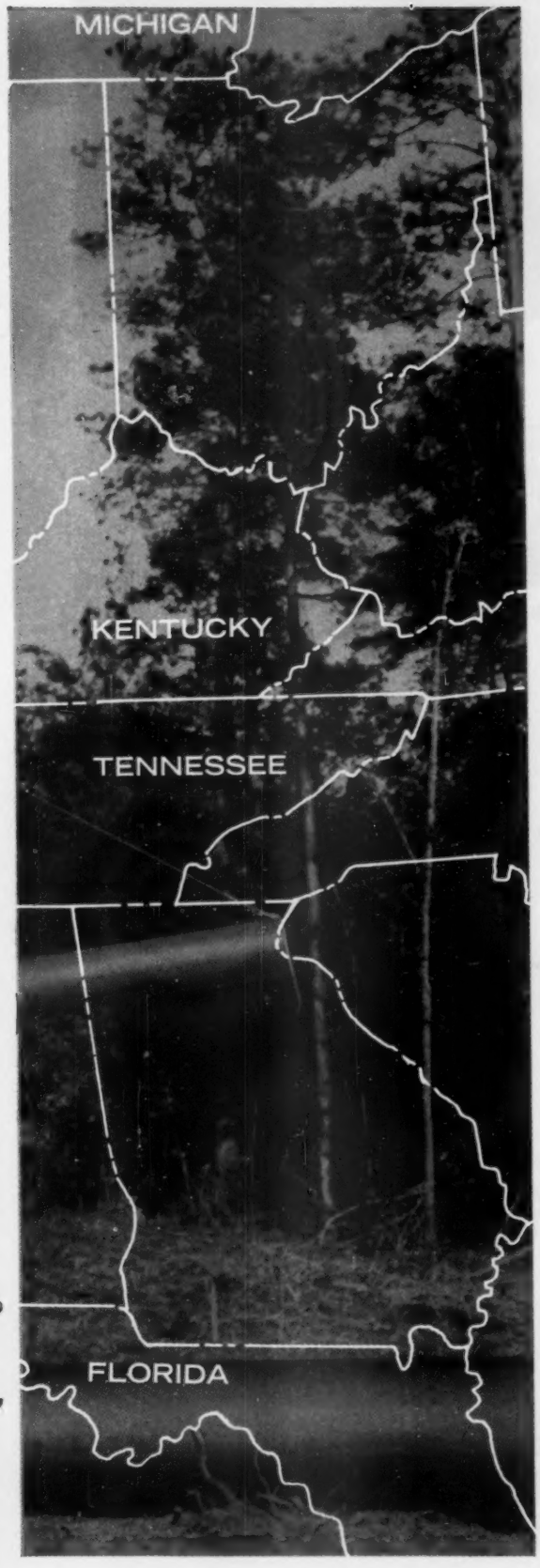

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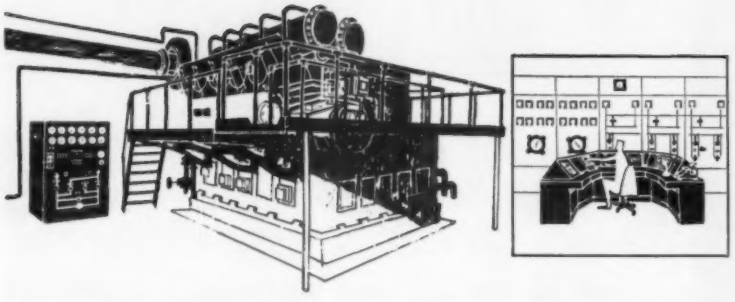

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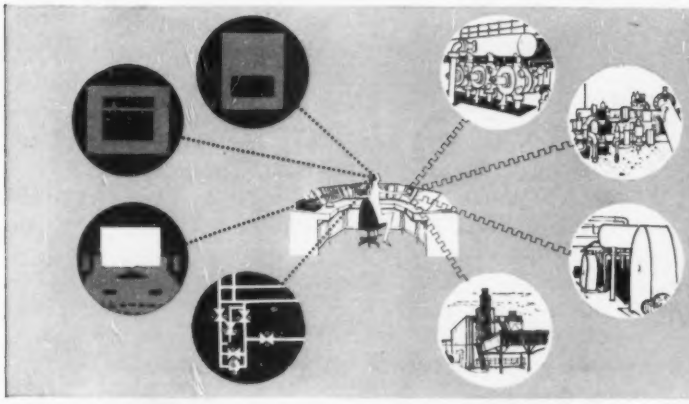

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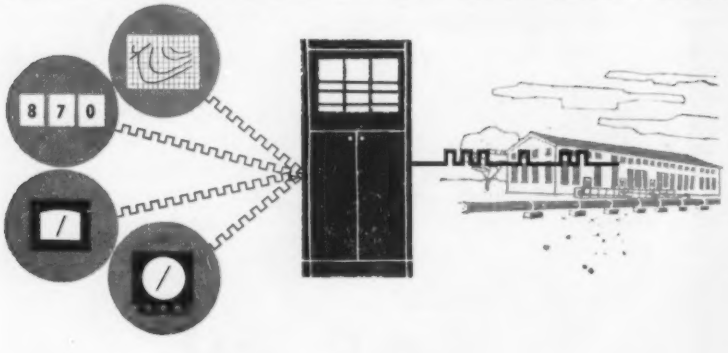

NORTH COMPUTER CONTROL makes remote stations independent of control commands or manual adjustments to maintain optimum operational status during variations of operating conditions and provides monitoring and alarms required for reliable unattended service.

North Paricode Systems bring you integrated communications, control, instrumentation and data processing from a single organization with the capability to design, engineer and produce reliable, fail-safe systems for progressive or full automation to your exact requirements.

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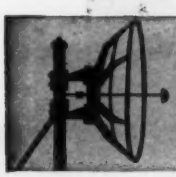
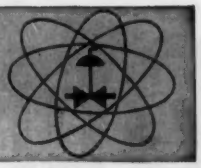


Communications and Automation



Edited by FRANK CHAPMAN

A single computer to control all elements of a long pipeline?

By F. VINTON LONG

A POPULAR topic among pipe liners these days is automation. And frequently it's pretty serious talk. Almost everybody is evaluating the progress to date in this field; and, in addition, many companies are making serious plans for further progressive steps in this direction. Other pipeline companies have joined with manufacturers of computers, etc., to undertake joint studies of the feasibility of completely automating large or long pipeline systems. In a number of cases very sizable sums of money have been spent in the investigations of mathematical models and other problems that must be accurately determined for computer control of a complex system.

These investigations will probably turn up a number of advantages for running a large or long pipeline system with a computer. In fact, if the experience of other industries can be used as an indication, unexpected dividends will continue to become available as the application of precepts now being discovered spread and become better understood. For example, in many of the process industries the progressive application of automation to the control of an entire process by a computer have resulted in similar advancement in the general state of the process art. And today many modern processes cannot be controlled by any other means than by computer control. They are simply too complicated, too refined, and corrections have to be made too fast.

Process industries have made great strides in overcoming many of their obstacles to computer control. Pipeliners still have many problems to be worked out, some of which are peculiar to the industry. For example, one of these is the geographical separation of the various components of the system and in a long pipeline system this "does make a difference."

Such a situation places an unprecedented emphasis on the reliability of the communication system.

A communications system is composed of links or units each connected to another. In a long system these are connected in series, like the older type of Christmas tree lights. And like these series strings of lights, they all have to work for you to have a circuit. The more you put on a string the less chance you have of getting any light or circuit for any length of time. This is a different situation from the new parallel strings (process setup) where one may go out without you missing it for a while.

To help get a feel for this type thing, let's make some assumptions and do some figuring. Assume our communications system is a microwave system. A reasonable spacing for repeater stations might average 25 miles. The "hop" between two adjacent stations would form one link. Under typical conditions we might expect that any one link on an ordinary system would be working 98 per cent or 99 per cent of the time. Let's use 99 per cent and make a table of the percentage of the time the whole system would be working from end to end as we add 25-mile links. If we use a slide rule the table would look something like this:

Total Distance in Miles	*Number of Links*	*Portion of Time Working Each Link*	*Entire System*	*Expected System Typical Outage Hours/Day*
25	1	.99	.99	.24
50	2	.99	.98±	.46
100	4	.99	.96±	.94
200	8	.99	.92±	1.83
500	20	.99	.82—	4.37
1000	40	.99	.67	7.93

Now when we determine the distance of a station from the control point and look up the expected typical outage per day in the table, it is evident that "we gotta problem."

There is a lot we can do about the microwave system itself, such as buying the best equipment available, following the most conservative engineering practices, using a diversity system, etc. We might upgrade the system to the extent that in 1000 miles the outage per typical day *due to propagation failure* (atmospheric difficulties as opposed to human or equipment) would be less than an hour a day for the whole system. But then this is not getting away from equipment and human failures

Continued on page 131

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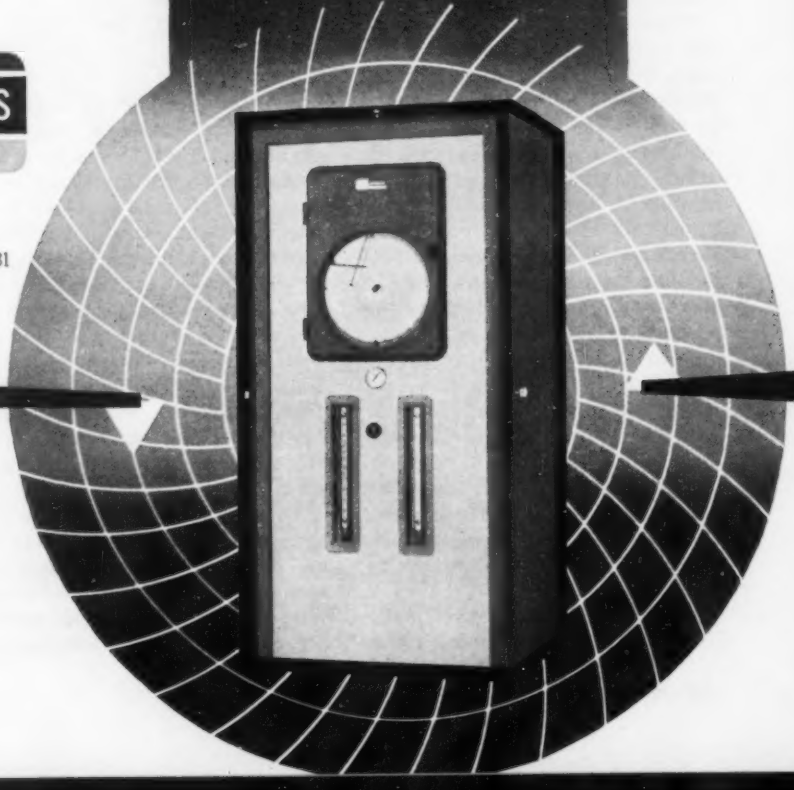

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The right side of the truck has larger storage bins than the left. Square compartment at bottom rear corner holds vise, shown mounted on back of truck. Note closed-in rear.

Truck body modified for corrosion work

For years, Colorado Interstate Gas Co.'s corrosion repair forces have been going about their work in station wagons. Used to haul equipment and tools, as well as personnel, the wagons "left much to be desired," according to W. I. Blount, superintendent of dispatching and communication.

A series of conferences between Blount and the corrosion men resulted in the idea of modifying a body for a half-ton pickup. The final choice was a long wheelbase Chevrolet, the long wheelbase being to provide a bit better riding over rough terrain.

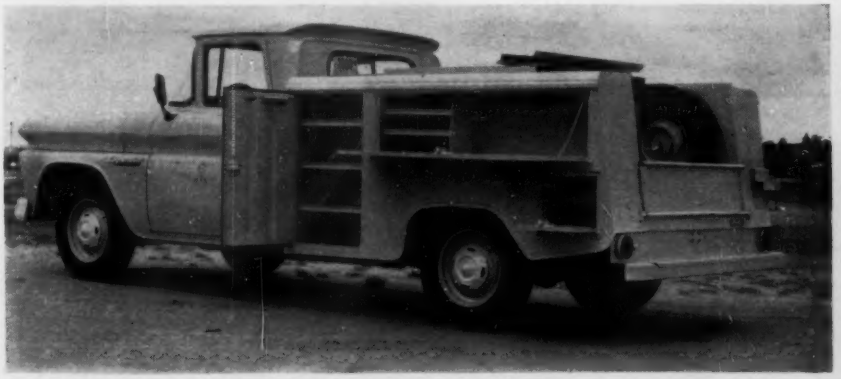
A special body was constructed to CIG specifications by the Winter-Weiss Co. of Denver. Outwardly, the truck looks much the same from both sides with —from front to back—a vertical, a horizontal, and a virtually square compartment on each side. The insides of these compartments, however, differ markedly, as shown in the pictures. One of the outstanding exterior features is the folding, telescoping set of doors that encloses the top and the rear, down to the top of the tail-gate.

The bins within the compartments are really where the truck is tailored to its job. One of the square bins houses a wire reel, the other a vise which is mounted on the back of the truck when in use. Many of the bins have tie-down straps mounted to hold certain pieces of equipment. Other bins—which carry electrical instruments—are closely sized and have foam rubber padding for added safety.

Loose materials, spare tires, and a crane that can be operated from the rear of the truck are carried on the truck bed.

The truck has proved so satisfactory that four more will be similarly fitted out. Blount reports, however, that there are already some new ideas for improving on this well thought-out, brand new design. ■

The left side of the truck with the smaller storage bins. A compartment similar to the one for the vise holds a wire reel. In this shot, the telescoping doors covering the top and the rear are open.



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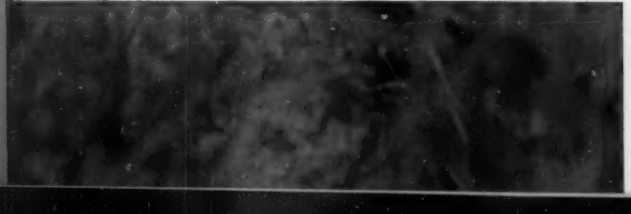
Youngstown – growing force in steel



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The Youngstown Sheet and Tube Company, Youngstown, Ohio.

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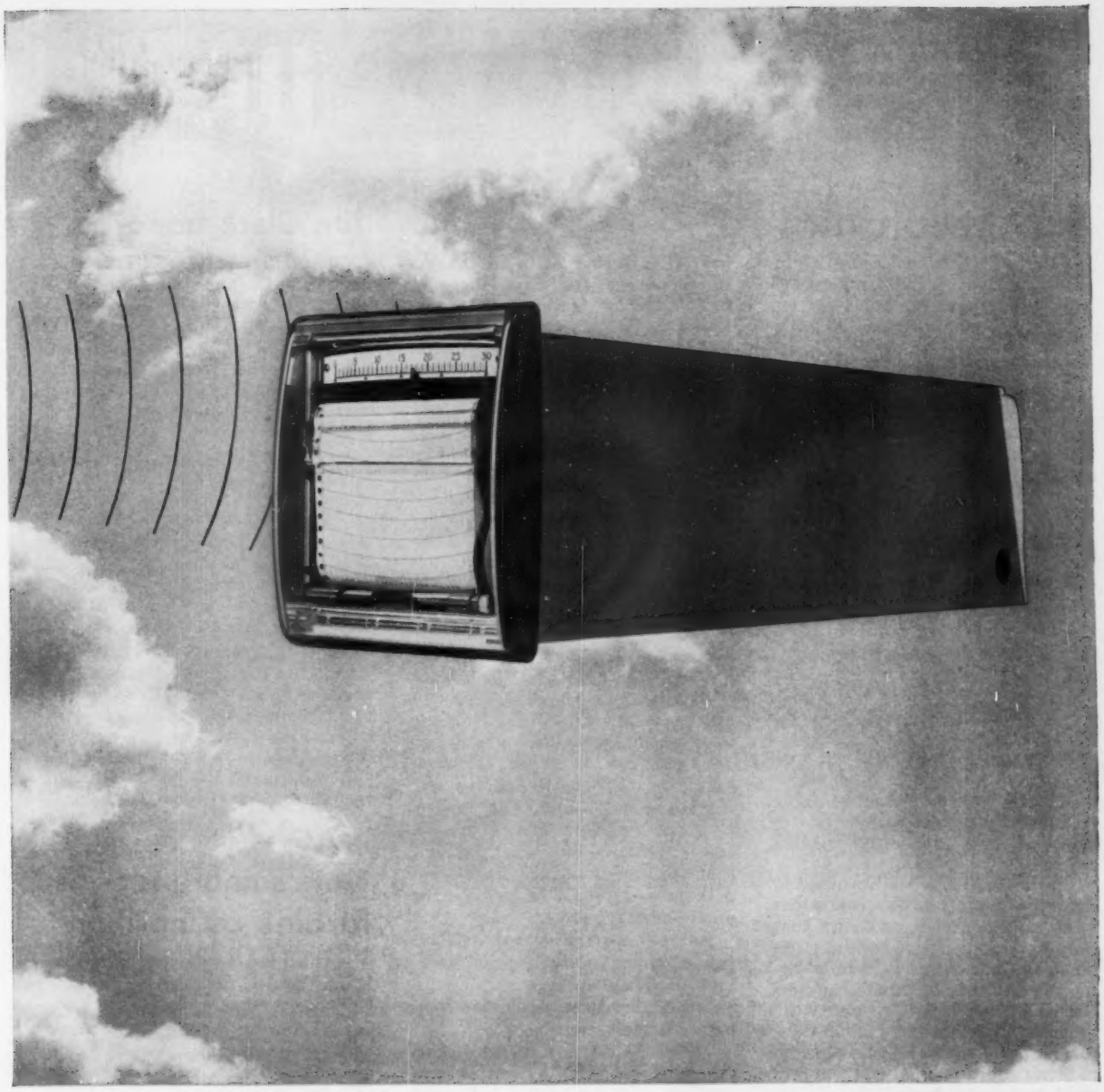
Standard impulse-duration cycle on the new Foxboro telemetering system is 2 seconds — 4 times as fast as any other standard system. The signal can be carried over any



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This is the telemetering system all industry has been asking for. For full details, write for Bulletin 17-12. Or better yet, ask your Foxboro Field Engineer for the complete story. The Foxboro Company, 344 Norfolk Street, Foxboro, Mass.

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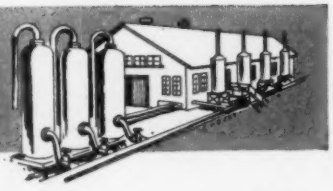
GAS PIPELINE NEWS



Escalation exited

Saying that natural gas price increases based on indefinite escalation provisions in producer gas sales contracts "are contrary to the public interest" and that such clauses filed after April 3 "shall be inoperative and of no effect at law," FPC has pretty definitely limited use of favored nation, spiral escalation, and price redetermination clauses. This creates a new policy from the federal regulatory agency.

In its rule-making order, FPC defined "definite" escalation clauses as "those which set forth any increases by specific amounts at definite future dates." Also spelled out as "definite" are those which provide for specific price changes to reimburse the gas seller for production or gathering tax increases. All others are indefinite and should not be written in after the third day of April.

Commissioner Arthur Kline opposed the rule. He said that a producer should have the right to some relief in order to protect himself from future inflation or other unforeseen events. Said Kline: "The producer should not be compelled to agree at the beginning of his contract to a fixed price for the gas 20 to 50 years in the future, when the conditions may be wholly different."

The southern California capers

Recent developments in the several moves and verbal altercations under the heading "Who Is Going to Bring How Much Gas to Southern California and From Where" are briefly reviewed.

First, Southern California and Southern Counties Gas companies (Los Angeles) let it be known that they have fully met conditions imposed by California's PUC in granting a certificate of public convenience and necessity to build the proposed Rock Springs (the in-California part) natural gas pipeline to bring additional natural gas into the Los Angeles basin.

Later, hearings before that PUC on the matter were held. Opponents: mainly Southern California Edison (Los Angeles electric utility that wants Texas and Mexican gas for its thermal generators, and does not want Pacific Lighting Corp. gas—or, at least, the two companies can't get together on such a proposition) and Tennessee Gas Transmission Co.'s affiliates. Other than opposing parties agreeing that they would let the other see work papers from which exhibits were evolved, there was little room for agreement. Edison's big power plants' gas loads are the keys to both Rock Springs and the Enchilada Inch.

R. E. Woodbury, SoCalEd's general counsel, appeared to take the approach that California is going to need all the natural gas it can get in the coming years. Hence, it might be that Rock Springs and Enchilada Inch will both be needed. Earlier, however, PLC's W. M. Jacobs said, outside the hearings, that he couldn't understand how both projects could be justified by public need.

As the hearing closed, counsel for the commission asked that hearings on Rock Springs and Enchilada Inch be consolidated for comparative evaluation.

Then, Southern California Gas Co. came out with a firm protest against any such action. It said that move (consolidation of the two cases) would definitely endanger the entire project (Rock Springs) by further delay and might lose the gas supply for southern California homes and industry forever.

TGT (through its California Gas Transmission Co.) asked Cal-PUC to consolidate the two proceedings. It said Rock Springs, after changes to meet PUC conditions, is now a completely new and different project with different volumes of gas, prices, and an economic feasibility based on obtaining additional gas from Transwestern, which has no application to provide it.

Jim Clark honored

The author of GAS' "The Gassing Game," James A. Clark, was given an appreciation dinner on March 17 in Houston. Some 1000 guests gathered to salute this author of books, syndicated columnist, and longtime writer, reporter, and consultant to the gas and oil industries.

Michel T. Halbouty, Houston gas and oil independent, headed a 21-member planning committee, including many of the best knowns in the gas and oil businesses today. Another committee, the general committee, was made up of 100 key people from every segment of gas and oil activities.

We will say that while he is not scratching for pennies, had he not given so much time to the gas and oil industries and spent his own money doing it, Jim Clark would probably be a wealthy man today —but perhaps not nearly so well thought of and respected.

New small gas turbine on horizon

According to Solar Aircraft Co., it has under development a new 600-hp gas turbine that will:

1. Have a life cycle equal to or better than conventional reciprocating engines, and require considerably less maintenance.

2. Reduce fuel consumption to below current industrial turbine performance and equal reciprocating engines.

3. Have a cost competitive with conventional reciprocating engines.

Automation booklet

Those in the gas industry interested in latest developments in automation equipment specifically for gas pipeline operations, might want to write North Electronics Co., Electronetics Division, Galion, Ohio, for a copy of its "Automation for the Gas (and Oil) Industry."

New Pitt Chem Quick-Dry Primer!

To maintain steady progress "down the line" and to eliminate costly installation delays . . . specify Pitt Chem Quick-Dry Universal Primer and realize these important advantages:

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Mcf-mile method used for TGT rates

FPC presiding examiner Joseph Zwerdling has issued a 131-page decision determining principles and methods to be used in allocating Tennessee Gas Transmission Co.'s cost of service among rate zones.

TGT's cost of service should be allocated among the six rate zones on its system under a method which combines the use of system-wide average costs on a mileage basis, together with a reflection of the company's historical allocation pattern.

TGT's present zone differentials have been in effect, subject to some change, since 1952. They were the outgrowth of a compromise settlement between Tennessee Gas and its customers in a 1952 rate proceeding. Since then, the zone differentials have been the subject of serious controversy between different groups of customer companies on the TGT system.

Columbia Gas System and the Consolidated Natural Gas System make their gas purchases from Tennessee Gas in its central zone (Kentucky) and eastern zone (West Virginia). They contend that the existing zone differentials shift a substantial portion of the New England zone costs to the central and eastern zones. Accordingly, they are required to subsidize the New England zone. On the other hand, customer companies in the New England area contend that under the existing zone differentials they have been carrying more than their proper share of TGT's total system costs.

Despite this continuing controversy, a determination of the troublesome zone allocation question has been avoided in all previous TGT rate cases up to this time.

Zwerdling stated the determination of which allocation method should be adopted required a choice between two basic approaches: (1) A method applying a system-wide average unit costs on a mileage basis (the Mcf-mile method). This assigns the same cost for transporting an Mcf of gas 100 miles, regardless of whether the transportation is in West Virginia, Pennsylvania, New York, or Massachusetts. Method No. 2, the zone-gate approach, involves the segregation of physical property on the basis of zone boundaries, under which each zone is treated as if it serves a separate operating entity.

New England intervenors in the case advocated the Mcf-mile method, approved by the commission for the Northern Natural system in a 1955 decision. Both TGT and the commission staff employed an Mcf-mile approach, but with some variations. But, Columbia and Consolidated urged the adoption of a zone-gate approach.

The examiner concluded that an Mcf-mile allocation method represents the most reasonable and appropriate approach for the TGT system, which he characterized as a single integrated pipeline system, operating as a single entity, with each part contributing to every other part. He held that while customers closer to the source of supply should properly pay less than those farther away, all should pay on the basis of average system-wide costs for each mile of transmission.

In rejecting the zone-gate approach, Zwerdling stressed that it was inconsistent with the basic principles upon which Tennessee's integrated system is designed and operated. The Tennessee system "is not truly susceptible" to segregation and division in such a way that one zone would not be dependent upon or affected by another, he said.

Gas for Minnesota mine approved

Northern Natural Gas Co. can deliver gas for use in a taconite processing plant and two communities in Minnesota (Docket CP-61-1).

Northern will deliver 12 MMcfd of firm gas to Reserve Mining Co. at Silver Bay, Minn. Also, Northern will sell up to 1.5 MMcfd (in the third year) to Iron Ranges Natural Gas Co. for resale in Silver Bay and up to 1.5 MMcfd of firm gas and up to 117.8 MMcfd of interruptible gas annually (both third-year volumes) to the city of Two Harbors, Minn. Northern also will sell, on an interruptible basis, almost 3 MMcfd of overrun gas annually to Iron Ranges for resale to Reserve Mining for use as boiler fuel in an electric generating plant.

Opposing the plan were the Fuels Research Council, National Coal Association, and the United Mine Workers of America.

Among other things, the coal interests objected to the use of 16-in. pipe to effect the service, contending that the use of anything larger than 12-in. would be uneconomical. While FPC must guard against improvident or extravagant installation of facilities which will not be used for a long time in the future, if ever, Presiding Examiner William J. Costello said, it is also obligated to consider the economic prospects and reasonable expectations of the future.

Northern expects, in the foreseeable future, to sell about 4.5 MMcfd of firm gas to Reserve Mining to meet demands of an expanded operation. Installing the added capacity at this time, Examiner Costello said, would probably involve less investment than installing the same increment of capacity by means of looping a 12-in. line several years from now.

Costello said the evidence favors approval of Northern's plan to provide capacity adequate for future development of the taconite industry in northern Minnesota. The additional cost, to provide the larger diameter pipe, estimated at about $80,000, is not an improvident or extravagant investment, Costello concluded.

France's Lacq field boosts production

It is reported that this year, France will have the largest plant in Europe, at Lacq, for treatment of natural gas and the world's largest sulfur factory.

Lacq's annual production will be 141 billion cu ft of purified gas; 130,000 tons of propane and butane; 260,000 tons of gasoline; and 1.4 million tons of sulfur.

This production will help to reduce by 10 per cent France's annual imports of power and fuel, which represent about one-third of her total consumption.

For the last few years, France has been developing the underground deposit of natural gas located at Lacq in the Pyrenees.

Extracted sulfur deposits in the gas are so abundant that France, which up to now has always had to import sulfur, has become an exporter.

THERE'S A BIT OF SALT IN THE WIND

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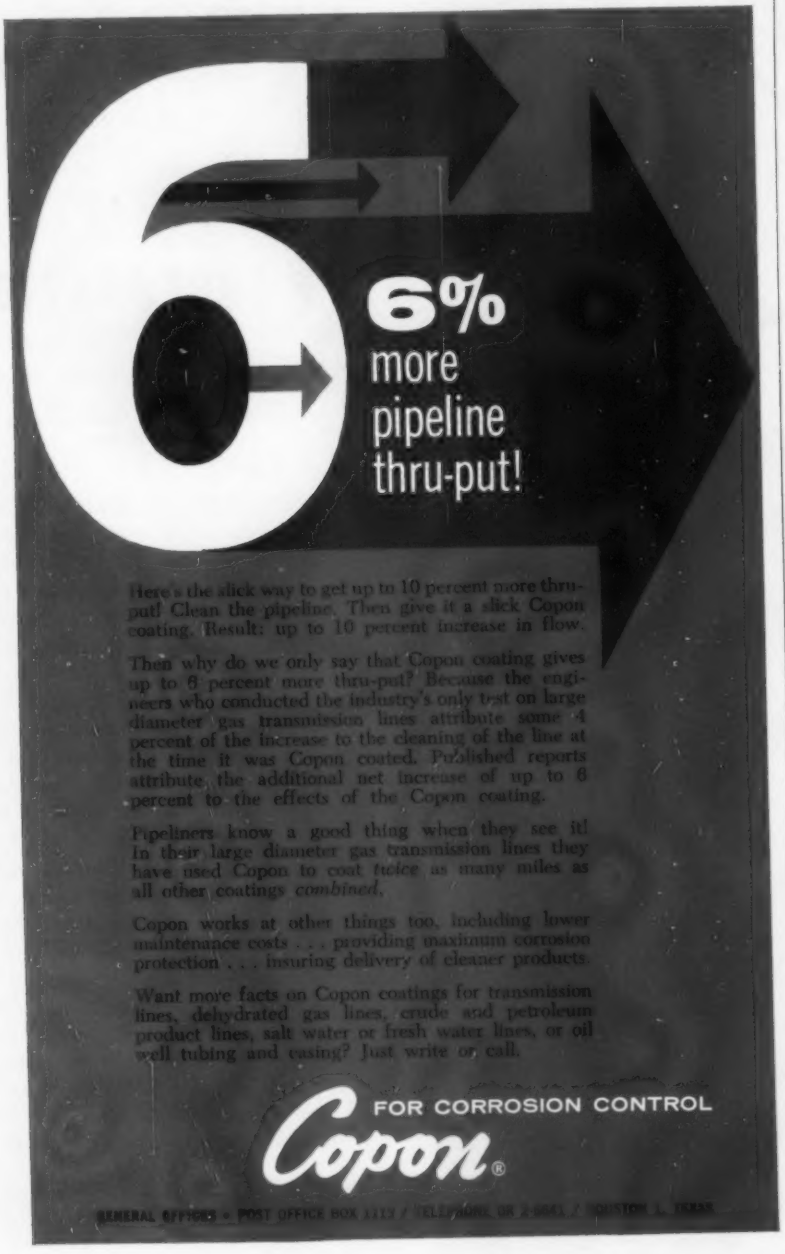
TGT affiliate asks FPC disclaimer

Tennessee California Gas Transmission Co. has asked FPC to disclaim jurisdiction over the 105-mile Texas section of the proposed $225 million Texas - Mexico - California gas pipeline.

As an alternate, should FPC decide that the Texas pipeline is subject to its jurisdiction, the company applied for a certificate of public convenience and necessity to construct and operate it.

Applications for export-import permits and presidential permits already are on file with FPC, and for authority to build and operate the 300-mile California section of the project with the California PUC.

In its FPC filing, Tennessee California said its ". . . proposed operations will not come within the meaning of the Natural Gas Act, nor will it be a natural gas company as defined by the Act," inasmuch as it does not propose to make sales of gas for resale in interstate commerce nor to transport gas in interstate commerce. All of its facilities will be within Texas.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Union Pacific builds gas processing plant

Union Pacific Railroad Co. will build a plant for the recovery of gasoline and other products from natural gas available in the Patrick Draw field in Wyoming.

Completion of the plant—which will be capable of processing 27 MMcfd of gas—is expected within six months. The plant will be in the field about 40 miles east of Rock Springs.

Gas will be processed from wells of five producers in the field: Union Pacific, Gulf Oil Corp., Forest Exploration Corp., Texaco Inc., and El Paso Natural Gas Products.

Hear TGT offshore plans

Hearings are underway at FPC on Tennessee Gas Transmission Co.'s plan to buy natural gas properties off shore from Cameron and Vermilion parishes in Louisiana.

TGT would buy the properties from Socony Mobil Oil Co., Continental Oil Co., and Newmont Oil Co. Purchase price is some $68.3 million, to be paid over a 16-year period.

In its initial filing, TGT proposed to construct facilities needed to take gas from the three producers. Subsequently, Tennessee and the producers agreed to the sale of the gas in-place.

Mountain Fuel buys new gas supply

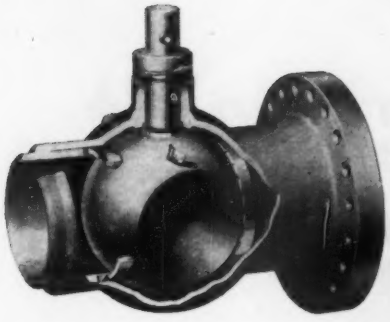
Mountain Fuel Supply Co., Salt Lake City, is purchasing the natural gas production of DeKalb Agricultural Association in Uintah county, Utah. Purchase price is 16.5 cents per Mcf at the wellhead.

To move the gas to market, MFS has joined with Utah Natural Gas Co. to build a $10-million, 94-mile, 20-in. line with a capacity of 100 MMcfd.

As part of the deal, Mountain Fuel will purchase a 50 per cent interest in the facilities of Utah Natural, a subsidiary of El Paso Natural Gas Co. MFS will operate all of the facilities the two concerns would own jointly.

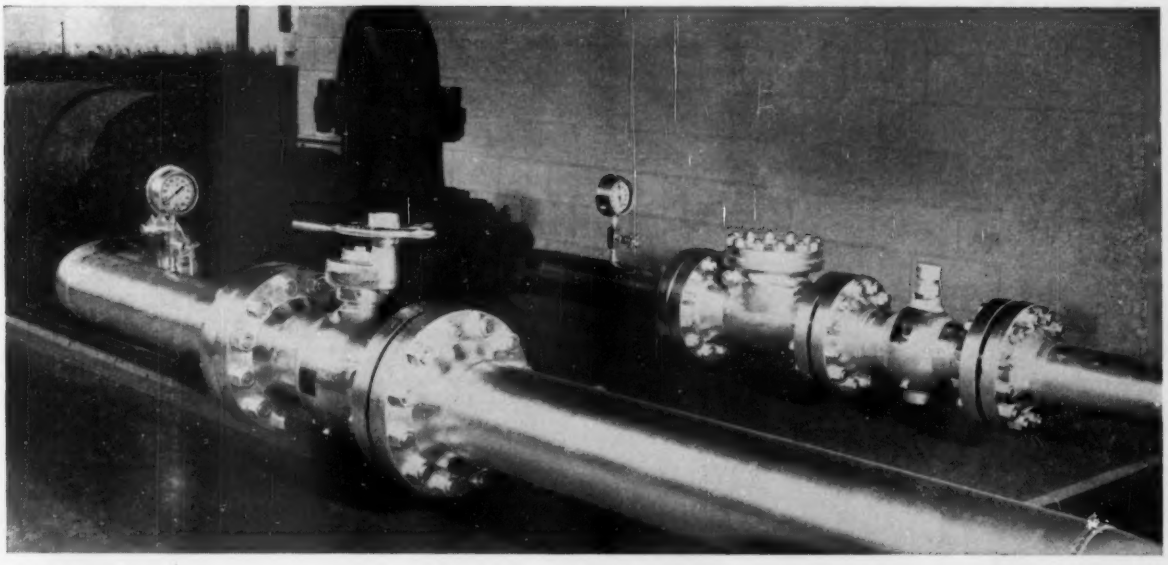
W. T. Nightingale, president of Mountain Fuel, said the arrangement should assure present customers an additional supply of relatively low cost gas for the foreseeable future.

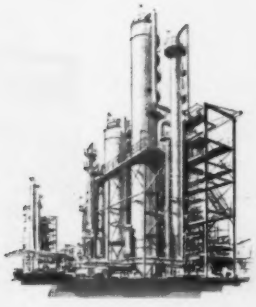
SAY GOODBYE TO VALVE REPAIR



That's right – with Cameron Ball Valves on the job you never need to make repairs. This big step forward in valve design – which makes practical the "sealed for life" construction – is brought about by the exclusive rotating seat principle which has proven so successful in our Type "F" Gate Valves.

Sturdy dogs on the Ball engage gear-like teeth on the Seat Rings to rotate the Seats a fraction of a turn each time the valve is opened. In all valves, maximum wear occurs on the seating surface area which is struck by the erosive blast of line fluid just as the port is uncovered on opening, or just as the flow is being pinched off on closing.





Rotation of the seats distributes this wear equally over the entire sealing surface and extends the life of the valve many times over valves with stationary sealing surfaces.

Also, being non-lubricated, all maintenance costs are eliminated. This means substantial savings in man hours, down time and inventories. Low torque requirements allow smaller operators – less energy on remote controls – easier operation an manual controls. Maximum economy – Maximum service – Mimimum size and weight. Available in sizes 2" to 36" in ASA and API ratings and with any type of end preparation. If you plan, specify or purchase valves, call or write Cameron for complete details.

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long lengths for economy

Long lengths of pipe mean fewer welds in the field . . . and fewer welds mean greater economy. It's as simple as that.

Bethlehem produces electric resistance-weld line pipe in lengths to 62 ft. Diameters range from 5 5/16 in. through 16 in. OD. It's all first-rate pipe, meeting API 5L (Grades A or B) or 5LX (X42, X46, or X52) specifications.

We make ERW pipe at Sparrows Point, Md., where we also produce continuous buttweld line pipe in sizes from ½ in. through 4½ in. OD in strict conformity with API 5L specifications.

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BETHLEHEM, PA.

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For a full line of line pipe

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3/4 in.

for safety

When pipe lines pass through built-up areas, safety becomes a primary consideration. The applicable codes often demand special practices, including thick-walled pipe.

That's where Bethlehem comes in. We make line pipe with ¾-in. walls from 18 in. through 42 in. OD, in 40-ft lengths. In fact, we are supplying a major gas transmission company with 36-in. OD pipe with walls measuring .844!

Bethlehem's large-diameter line pipe is electric fusion-welded and cold-expanded at our Steelton, Pa., mill—probably the most modern in the industry.

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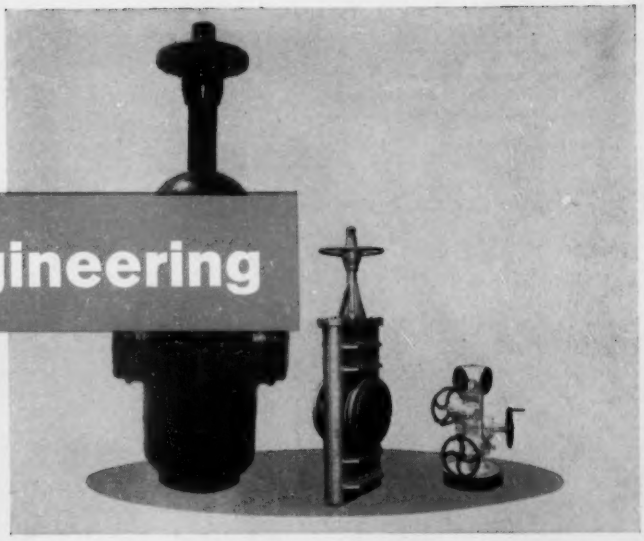
NEW W-K-M COMPUTER PREDICTS PERFORMANCE



Left to right above, W-K-M's new: *Safe-T-Seal* Gate Valve (ASA); Pressure Sealing Gate Valve (ASA); Cross-type Triple Gate Valve (API).

Unique strain gauge analyzer pre-solves your valve problems

In *seconds* it gives answers that used to take *days*. This unusual digital logging computer developed to W-K-M engineering specifications finds out what will happen to a valve under every conceivable service stress.

The W-K-M computer measures strain, applies corrections for temperature, test material and gauge factors, and prints the results of its stress calculations. It can analyze 40 areas of a valve in less than 40 seconds!

Advanced research is an important part of TOTAL Valve Engineering—W-K-M's unique dedication to *all* phases of valve technology. Another reason why W-K-M Valves perform better, last longer . . . on the world's toughest jobs.

W-K-M

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Entering its tenth year of service to the industries that produce and distribute natural gas, Transco points with pride to the stability of markets it affords producers, and to the economies of transmission it affords customers. TRANSCO—the pipeline carrying natural gas to the markets where the most people are.

TRANSCO 10TH ANNIVERSARY

TRANSCONTINENTAL GAS PIPE LINE CORPORATION

FPC looking into Midwestern rates

FPC will investigate natural gas rates charged by Midwestern Gas Transmission Co. for service on the southern portion of its pipeline system serving the Chicago-Gary metropolitan area.

FPC wants to determine whether any of Midwestern's rates "are unjust, unreasonable, unduly discriminatory, or preferential."

When FPC authorized Midwestern to construct its southern system — extending from Portland, Tenn., to Joliet, Ill.—in May 1959, the commission said that the rate as then proposed could become discriminatory under changed conditions. It required Midwestern to file within one month after the first year of operation a rate satisfactory to the commission.

On Dec. 14, 1960, Midwestern filed a statement and supporting data which it said complied with the commission's earlier directive. The commission, however, said that the filing "does not appear to meet the requirements" imposed by its May 1959 order.

A. O. Smith expands

A. O. Smith Corp.'s new 3000-ton crimping press will enable the company to manufacture large diameter and heavier wall pipe of steel with high physical properties at its Milwaukee plant.

Up to this time, A. O. Smith flash-welded 36-in. diameter pipe was available only from its Houston plant.

The new press is the second of three major equipment changes in the forming press line. When completed, the new press line will include in addition to the crimping press, a gigantic 18,000-ton closing press, a U-ing press, new feeders, unloaders, and complete rearrangement of conveyor systems.

Translations slated

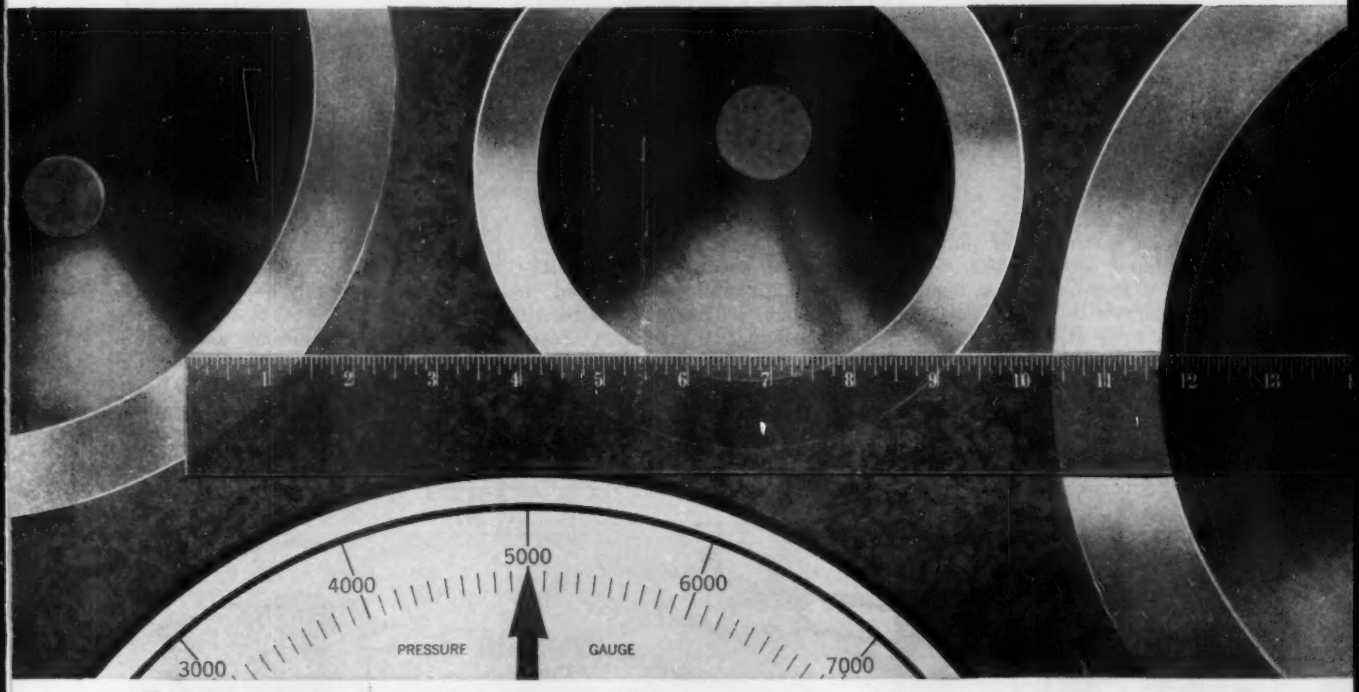
Chemical Engineers in the U. S. will soon be able to read technical papers written by their colleagues in Russia, Eastern and Central Europe and China.

In a new quarterly journal to be published by the American Institute of Chemical Engineers, the best work in chemical engineering being done in Russia and the East will be translated. The journal, scheduled for publication in October, 1961, will receive financial aid from the National Science Foundation.

It takes cannon-barrel pipe to store gas at 5,000 psi

This mark tells you a product is made of modern, dependable Steel.

North of the Susquehanna River near Renovo, Pennsylvania, is a depleted gas reservoir known as Leidy Field. It has just been converted into an underground gas storage field. The field has a total of 85 wells and is roughly 13 miles long and 7 miles wide.



To store gas in this natural reservoir when completed requires an injection pressure of 5,000 psi at the wellhead. This storage field provides for a peak withdrawal of 800 million cubic feet each day and an average withdrawal of 400 million cubic feet per day during the winter season.

Seamless Steel Line Pipe was selected for this project, because the high pressures demanded strong, reliable pipe with almost cannon-barrel thickness. Pipe walls ranged up to 1.312" in thickness in pipe size 6⅝-inch to 12¾-inch.

USS National Seamless Steel Line Pipe met these requirements. It is ideal for lines that handle gas, liquids and solids. It's available in a complete range of wall thicknesses, steel analyses, and in diameters up to 26 inches—USS National Electric-Weld Line Pipe up to 36 inches. Write for information on our products, services and facilities. National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

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NARUC recommends changes in gas act

A special committee report was made during the recent annual meeting of the National Association of Railroad and Utilities Commissioners proposing certain amendments to the Natural Gas Act.

These amendments would:

1. Outlaw indefinite pricing clauses in natural gas contracts.
2. Eliminate the prohibition in the Act against suspension of rate changes applicable to natural gas sold for resale for industrial use.
3. Prohibit consecutive rate increases resulting from the automatic operation of section 4 (e) of the Act.
4. Amend section 7 (e) of the Act to make it jurisdictional to the issuance of a certificate of public convenience and necessity that the FPC make a specific finding upon the consistency with the public interest of the price at which natural gas is sold in interstate commerce pursuant to a certificate or certificates of public convenience and necessity; and
5. Prescribe procedural requirements in the hearings and disposition of matters before FPC.

The amendments were drafted in bill form and were introduced in the 87th Congress as H.R. 2757 by Rep. Dingell of Michigan; H.R. 2781 by Rep. Moss of California; H.R. 4095 by Rep. Flynt of Georgia; and S. 666, by Sen. Magnuson of Washington.

GAS • Pipeline Notes

Texas Eastern Transmission Corp. has accepted a modified order issued by the FPC approving a proposed settlement of its pending gas rate increases. A condition contained in a previous order, and objected to by TET, was deleted.

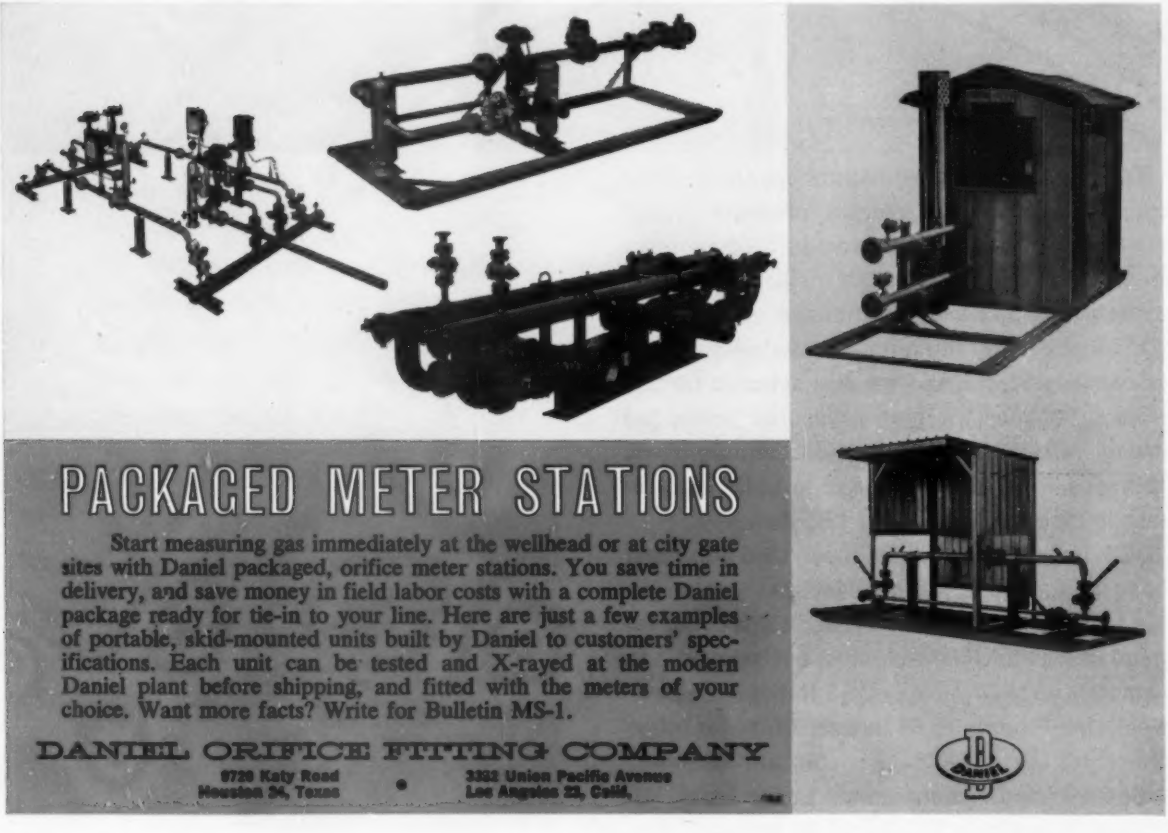
Cooper-Bessemer's 10,500-hp RT-248 gas turbine was featured in the company's display at the recent Gas Turbine Conference in Washington. The "Wall of Light," an 8-ft x 15-ft transparency, showed the initial installation of the RT-248 powered by a modified Pratt & Whitney Aircraft J-57 jet engine.

Some 25 sales representatives from all parts of the U. S. viewed new T. D. Williamson equipment during the company's recent three-day sales conference in Tulsa. Representatives from Canada and Mexico also attended the meeting.

Stupp Bros. Bridge & Iron Co., St. Louis, has acquired stock interests of the Cal-Metal Pipe Corp. of Louisiana, Baton Rouge. Stupp purchased the remaining stock interests formerly held by the Cal-Metal Corp., Torrance, Calif. The Cal-Metal name will be dropped and the new subsidiary will be known as the Stupp Corp.

Taylor Instrument Companies' newest subsidiary begins operations in April. Taylor Instrument Mexicano, S. A., located six miles from Mexico City, will do some local manufacturing and handle instrument assembly and repair.

An FPC presiding examiner's decision authorizing South Georgia Natural Gas to provide natural gas service to two Georgia towns has become effective. The towns are Sylvester and Ocilla.


PACKAGED METER STATIONS
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communications • *Cont'd.*

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which would wield an increasing influence.

A leased telephone system or a combined leased wire and microwave system might or might not be a more reliable communications system, depending on location and other uncontrollable factors. At any rate, the disadvantages of a long communications system cannot be completely avoided and generally will cause difficulties in any integrated central system, unless its characteristics are carefully considered from the beginning.

In many cases the situation indicated above may be sufficient reason to shorten the distance from component to computer by placing one or more sub-control centers at strategic points in the line or otherwise altering the philosophy of one computer in complete control of all equipment of a long line. A rival philosophy of "set point" control might be the more feasible.

In the case of "set point" control all the devices within a station would be controlled by a controller or computer located within the station. This controller or computer would receive "set points" from time to time from the central dispatching office computer or personnel. By this means no control loops would be closed via the communications system and only occasional contact would be necessary between the control point and a controlled station.

In many instances careful evaluation of alternatives to complete control by a single computer will be warranted for long lines or large systems. But even where an alternative is contrary to the ruling objectives or desires, it could be a very serious mistake to proceed "full steam ahead" without a good look at the special problems related to geographical separation. ■

Washington • *Cont'd.*

from page 17

fires the initial efforts have ignited are put out.

This may have been a factor in the delay in the White House' formal submission of the nomina-

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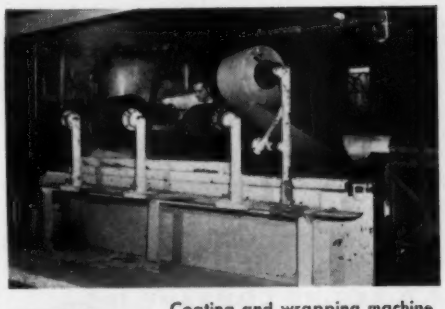
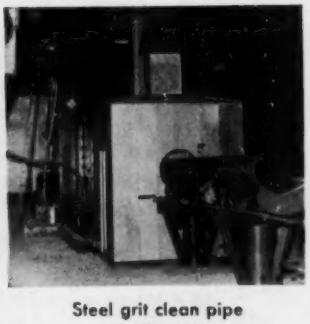


Coating and wrapping machine



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tions of Joseph C. Swidler and Howard Morgan to fill two posts on the FPC. Although he announced in mid-January he would nominate the two men, and name Swidler Chairman, the formal nominations had not been sent to Congress six weeks later.

The President did appear well on the way to getting the first power he needs to begin changing the makeup of these commissions. This was the extension of the Reorganization Act, a law which permits him to make fairly substantial changes in government agencies by executive order, unless the Congress actively disapproves them within 60 days.

Gathering storm

FIRST clouds of a gathering storm for the gas industry have come into view.

The Kennedy Administration, with most of its top officials admittedly with little or no knowledge of the gas and oil industry, is moving in several directions which will probably lead to trouble for the industry.

So far, after only a few months in office, the moves are preliminary and only hint at the serious problems ahead. Some may never materialize, but the total does spell trouble.

First major indication came from Interior Secretary Udall. Still wheeling and dealing as he was accustomed to when once a member of the 435-member House of Representatives, the secretary resurrected the old Truman Fair Deal "basic electric power program."

This is nothing more or less than an all-out public power development program. There are five goals:

1. Federal dams shall, where feasible, include facilities for generating electric power. (This would turn many relatively small flood control projects into additional electric power-generating facilities.)

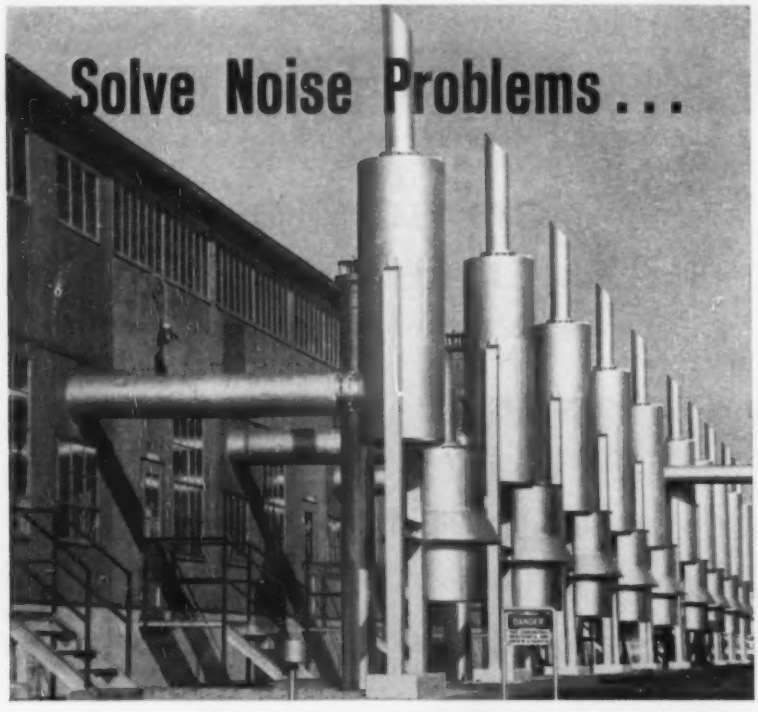
2. Preference in power sales shall be given to public agencies and rural consumers. (Public agencies include not only federal and state power consuming functions, such as Atomic Energy Commission facilities, but also federal, state and municipal power distributing systems.)

3. Power disposal shall be for the particular benefit of domestic and rural consumers.

4. Power shall be sold at the lowest possible rates consistent with sound business principles. (Sound business principles has always embodied an entirely different concept to the bureaucrat with a tax-exempt public agency than to a normal business or utility.)

5. Power disposal shall be such as to encourage widespread use and to prevent monopolization. (This goal is particularly aimed at "greedy electric utility barons," giving the public power planners all the leeway needed to expand in any direction at any cost.)

While the electric power industry is obviously the prime target, it is equally obvious that broad government electric power programs cannot even appear successful without limiting markets for competing fuels. Such programs



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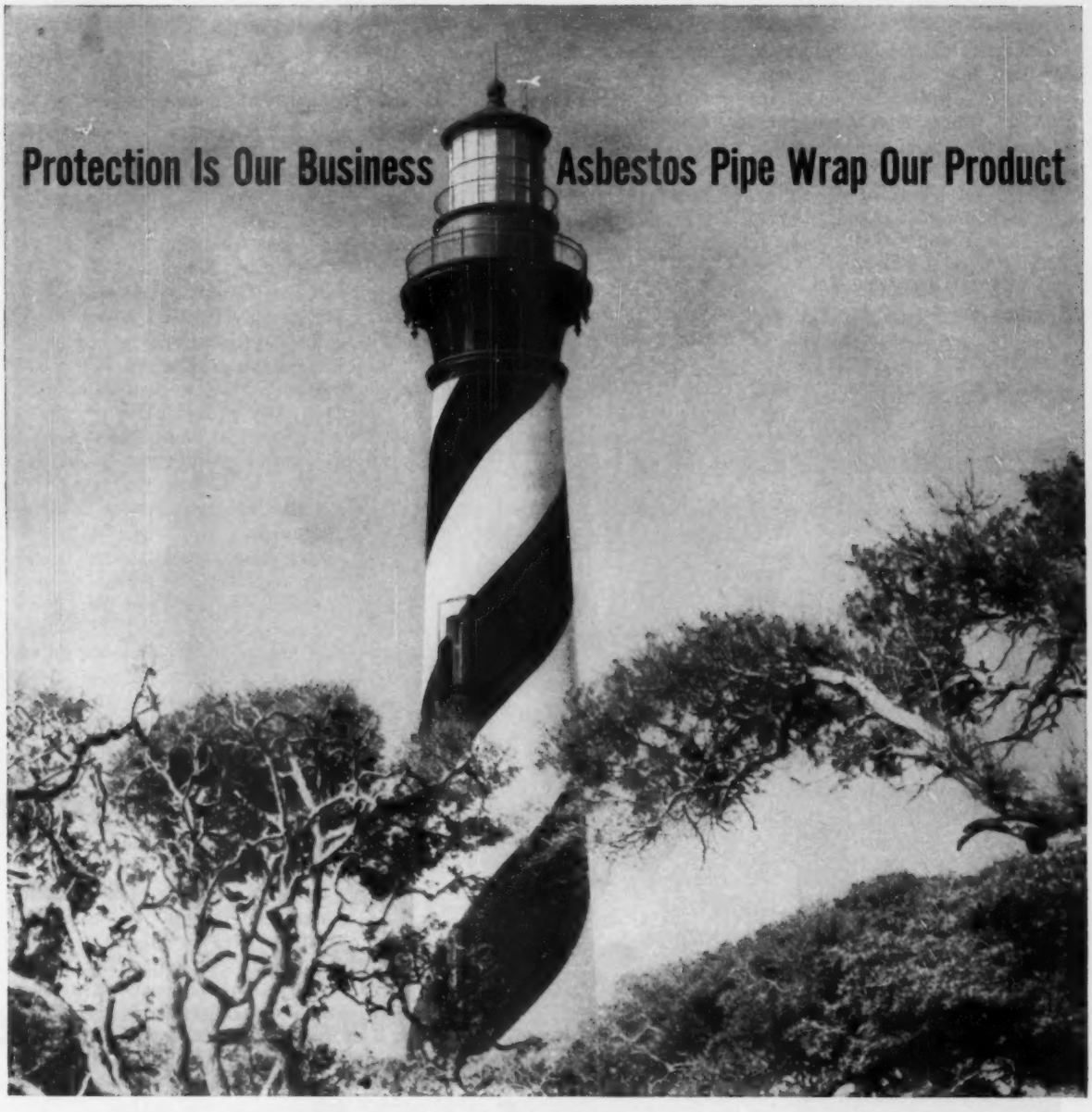

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cannot sell power "at the lowest possible rates," build generating facilities into nearly every dam, "encourage widespread use" or meet the other criteria without a strong move to "conserve" other fuels.

It will get plenty of opposition, but probably not enough from sources that would really count to knock it down.

Secretary Udall intends to fight hard for this program. "The furnishing of an adequate supply of low-cost power for the homes, farms and industry sufficient to service a dynamic economy is a matter of basic importance to the economic growth and defense of the nation," he says.

He adds that immediate attention will be given to "expanding the planning activities of the (Interior) Department to make possible the timely construction and full development of new projects and facilities and the maximum practicable amount of firm power for the ultimate user from federal power systems." He also intends to enlarge "regional cooperative pooling of generation and transmission facilities."

The near-emasculation of the road-block powers of the House Rules Committee, instigated by the White House through Speaker Sam Rayburn, similarly points to possible future difficulties.

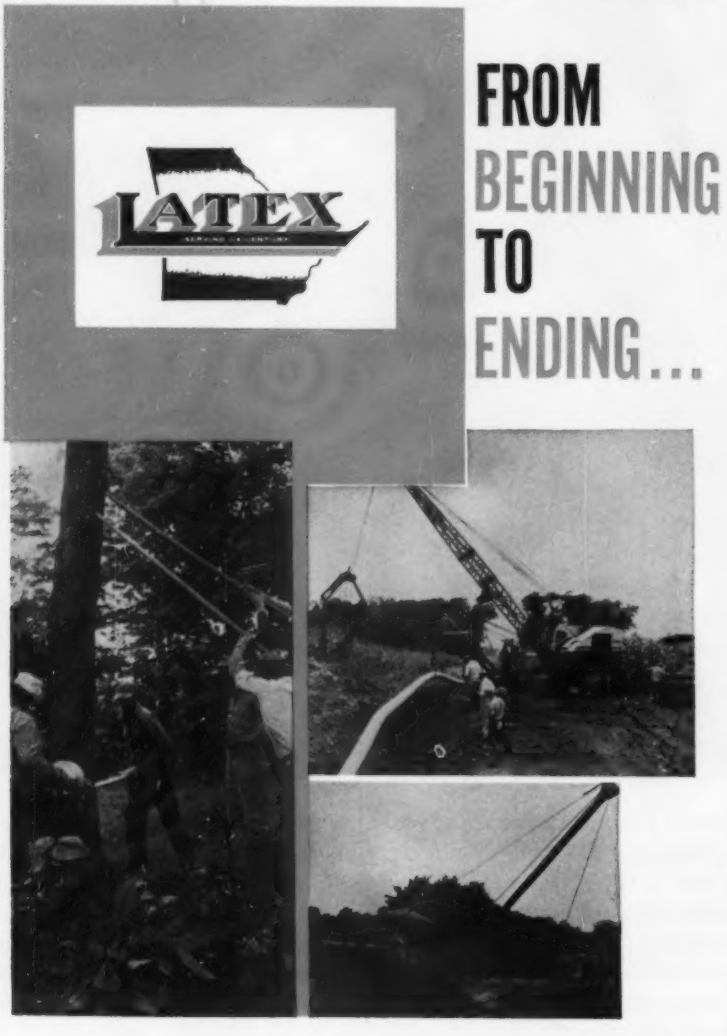
Rules Committee Chairman Howard Smith (D., Va.) is now determined to make every move possible to embarrass the Speaker, with whom he has worked as a quiet and effective legislative screen for many years. Thus, Rep. Rayburn now will have to fight on his own to hold back bills which may be popular but with which he does not agree.

The quick approval of the resolution to create a special 15-man committee to study the need for a "national fuels policy" illustrates this new situation. President Kennedy has publicly been a strong supporter of a national fuels policy study, the coal industry has fought hard for it, and congressmen from coal and consumer states have supported it. But Rep. Rayburn privately was more disposed to let this proposal lie around and collect dust.

In approving the resolution, the committee refused to agree to create a joint Senate-House study group. This is a minor victory but does leave the way open for the Senate to create a similar group. Such a two-headed study would inevitably lengthen the time it would take to produce a final recommendation for full congressional action.

This same type of cold war between Reps. Smith and Rayburn could spell trouble on other fronts. Rep. Smith could easily release for a vote a simple depletion-cutting measure, without waiting for the full tax study. This would be another bill which the Speaker would rather not see come to a head because of its unpopularity in his home state of Texas but support within the Kennedy Administration. Similarly, a pure natural gas decontrol bill pushed to a House floor vote now would be painful, without the necessary groundwork.

So, it looks like a stormy time ahead for the gas industry.



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H. J. Etchison, District Superintendent for the Northern Illinois Gas Company, and Koppers Serviceman A. C. Hueseman, check Bitumastic coating on pipeline project near Belvidere, Illinois.

"It's a real help to have a coatings serviceman on the job!"

That's the way H. J. Etchison, District Superintendent for Northern Illinois Gas Company, summed up Koppers Serviceman A. C. Hueseman's role on the company's new 22 inch gas line in Illinois between East Dubuque and Des Plaines.

"A serviceman brings expert assistance to the men on the job," Mr. Etchison said. "It saved us time and money having a specialist on the spot to tackle unexpected coating problems. We've found that servicemen have solved most of these problems on other jobs and they're able to anticipate possible trouble spots in advance."

Northern Illinois Gas Company's new line delivers gas from a supplier into its system serving suburban Chicago. It is typical of installations where serviceman Hueseman has helped gas companies with the application of high quality Bitumastic® Enamels. And his travels have carried him across the nation so many times that, as he says, "almost anywhere is home."

A Koppers field service specialist can help you get the most for your corrosion-prevention investment. For more information on the proved performance of Bitumastic pipeline coatings, mail the coupon or write: Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pennsylvania. District Offices: Boston, Chicago, Los Angeles, Pittsburgh, New York, Woodward, Ala., Houston, Texas (Mavor-Kelly Company). In Canada: Koppers Products, Ltd., Toronto, Ont.

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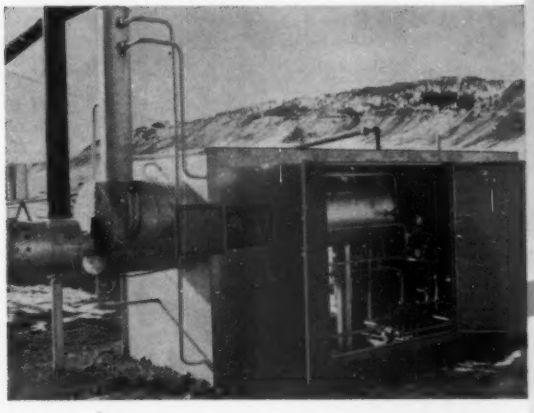

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